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EDITORIAL.

BESIDES FURNISHING A large proportion of the cobalt and nickel consumed in the world, New Caledonia promises to occupy an equally prominent position in the chrome ore industry. Within the last three years the exports of chromite from this colony have more than doubled, and it is currently reported that American consumers have contracted for large future deliveries which undoubtedly will give a further impetus to the trade. The existence of unusually rich and extensive orebodies and cheap ocean freights are factors contributing to the successful development of the industry in this remote country.

WE ARE INFORMED that the Ore Concentration Syndicate, owning the Elmore patents on concentration of oil, has contracted with Mr. James W. Van Meter whereby the latter withdraws from the business of concentrating ores by oil, except under license from the Elmore company. We have also received a letter from Mr. Franklin W. Smith stating that he entered into arrangements with Mr. Van Meter for a plant designed to test the process on Arizona ores and paid a portion of the cost at the time this arrangement was made, on July 7. Nevertheless, Mr. Smith learned by letter, dated September 14, from the San Francisco office of the Elmore company, that Mr. Van Meter had disposed of his rights to them on April 21. We make no comment.

A CONSIDERABLE REDUCTION in freight rates on coal in Rhodesia is noted in the July report of the Rhodesia Chamber of Mines. In response to the urgent protests of the Chamber the Rhodesian railway has made a rate of 0.625d. (1.25c.) per ton-mile from the Wankie colliery to Bulawayo on contracts of 100 tons per month and over in carload lots. Considering the high tariffs charged by the Rhodesian railways, this is a decided concession. It represents a saving to consumers on the minimum quantity of coal of 6s. 8d. ($1.62) per ton. A rate of 1.25c. per ton-mile for coal is high compared with that charged on long hauls by some of the great trunk lines of the United States, yet it is fully as low as the rates charged by many railroads for shorter hauls. The rate on anthracite coal from the Pennsylvania mines to tidewater is about 1c. per ton-mile.

English railways in the Midland district charge an average rate of about 1.65c. per ton-mile for hauls of 25 to 120 miles. Considering all the circumstances, consumers at Bulawayo, who are able to take advantage of the rate, will get coal about as cheaply as they ought to expect.

IT IS ABOUT time that the description of screens should be less loosely made; while we may not quite expect that degree of accuracy for which Mr. Philip Argall made a plea in this JOURNAL a short time ago, we certainly have a right to expect that publications such as *The Engineer* and *The Journal of the Mining and Chemical and Metallurgical Society of South Africa* will cease writing about "3600 mesh screen" and "64 holes per sq. inch" in the same paragraph. Now, "3600 mesh" means 3600 holes per linear inch, at least that is the usage and has been the usage among millmen for a time antedating either tube-mills or the Rand itself. "3600 mesh screen" should read "60-mesh," and "64 holes per sq. inch" is an 8-mesh screen. Let us at least agree on some definite use of such technical terms, and if our friends in England and South Africa prefer some other style we will adopt it, but looseness of phraseology is fatal to technical literature.

A STIR HAS been created in London by the report of the discovery of gold-bearing conglomerate or 'banket' in southern Rhodesia. The locality is near the Hunyani river, in the Lomagunda district. Rich ore is stated to have been followed to a depth of 250 ft., an average of 19 dwt. per ton being obtained over an average width of 5 ft. Of course, such a find calls forth the talk of "a second Rand," and is an event of exceeding interest to those interested in the development of British South Africa. Incidentally, we may comment on the comparative rarity of conglomerate beds rich enough in gold to be profitably exploited. In West Africa the Tarkwa reef bears some resemblance to the deposits of the Rand, a resemblance which has proved geologic rather than economic. In South Dakota the Potsdam conglomerate has been mined extensively and profitably. In northern California there is conglomerate that carries gold, and in southern Colorado there are layers of pebbly sandstone which have been worked in a desultory way, but none of these have proved profitable as mines. Of course, we omit the 'deep leads,' although after all the difference between the "petrified" river channel and the estuarine, or shore deposits of consolidated gravel, is one which is better appreciated by the geologist than it is apparent to the miner. Whether the gold is as detrital in origin as the enclosing pebbles, or whether it was introduced later by precipitation from vagrant solutions, is a question which will be answered variously at Johannesburg and at Deadwood.

Conglomerates are common members of any sedimentary series; most of the older sedimentary rocks have felt the disturbing and enriching effects of igneous unrest, and its sequel of thermal activity, therefore it is remarkable that the copper-bearing conglomerates of Lake Superior and the gold-bearing 'banket' of the Rand should still stand as occurrences rare, not only for their extent, but in the lavishness of their mineralization.

IT IS NOW evident that the coal output of the United States this year will show a considerable reduction from last year's record-breaking figures. The reduction may amount to ten per cent. The chief factor in lessening the output has been, of course, the lighter demand from our great manufacturing centers, and a resulting fall in the fuel requirements of railroads. The consumption of coal is so closely related to the production of iron and steel that the lessened activity at blast furnaces and steel works inevitably results in curtailing the output of coal. The bituminous mines of the Central West and certain districts along the Atlantic seaboard seem to have suffered most this year. In Alabama, where many miners have been on a strike since July, the output is slowly approaching normal. West Virginia output shows slight change. In western Pennsylvania the railroad mines of the Pittsburg district have been busy since shipments up the lakes started, but the output of the Connellsville region has been restricted by a light demand for coke. Present indications are that, as the iron and steel markets are picking up strength, the demand for bituminous coal will improve. An anthracite output short of last year's total will excite no surprise, since it is generally understood that conditions last year, as a result of the 1902 strike, were abnormal, and the year stands by itself. Hence, the 1903 output cannot be fairly compared with that of 1901, or with the probable figures of 1904.

THE PAYMENT OF CHECK-WEIGHMEN.

Judge Gray's decision in the controversy as to the payment of check-weighmen and check-docking bosses at the Pennsylvania anthracite mines is mentioned in our news columns. The controversy grew out of the interpretation to be put on the fifth award of the Anthracite Coal Strike Commission, the effect of an opinion given by Carroll D. Wright as arbitrator and a possible conflict between the award and State laws concerning assignments of wages.

Judge Gray's decision is, briefly, that check-weighmen and check-docking bosses should be employed wherever a majority of contract miners petition for them. The wages of the check-weighmen and the check-docking bosses shall be fixed, collected and paid by the miners, in such manner as the miners by a majority vote shall decide. The officials at the mines should co-operate with the miners in the appointment and the paying of such check-weighmen and check-docking bosses, and no assignments of earnings for that purpose were necessary under the decision of the Anthracite Strike Commission. The courts of the State are, however, the proper tribunals for settling the liability of the companies under the State laws.

The decision is in the main in favor of the miners. What its effect will be remains to be seen. There is every probability, however, that non-union miners who have deductions made from their wages will take the matter before the courts. This is probably what the operators desire. The final word in the matter has not been spoken.

STEEL PRODUCTION.

We have heretofore published the statistics of production of bessemer steel in 1903. We have now received from the American Iron & Steel Association the statement of the output of open-hearth steel, the details of which are given on another page of this issue.

The total production of ingots, including a small quantity of direct castings, by the open-hearth furnaces was as follows, in long tons:

	1902.		1903.		Changes.
	Tons.	Per ct.	Tons.	Per ct.	Tons.
Acid	1,191,196	20.9	1,095,876	18.8	D.95,320
Basic	4,496,533	79.1	4,741,913	81.2	I.245,380
Total	**5,687,729**	**100.0**	**5,837,789**	**100.0**	**I.150,060**

This shows that, while there was a decrease of 8 per cent in steel made by the acid process, the output of basic steel gained 5.5 per cent, the result being an increase of 2.6 per cent in the total output. This again emphasizes the advance in basic steel making. The basic furnaces now furnish four-fifths of our open-hearth steel, and nearly one-third of our entire production.

This is further shown by the following table, which gives the entire production of steel of all kinds in 1903. The output of bessemer, or converter, steel is entirely by the acid process, the basic converter having been always a negligible factor in our practice. The figures below are also in long tons:

	Acid.		Basic.	
	Tons.	Per ct.	Tons.	Per ct.
Bessemer	8,577,228	59.0	.....	....
Open-hearth	1,095,876	7.5	4,741,913	32.6
Crucible, etc.	121,000	0 9	.....	....
Total	9,794,104	67.4	4,741,913	32.6
Totals, 1902	**10,450,717**	**69.9**	**4,496,533**	**30.1**

Over 40 per cent of the total was open-hearth metal, and the loss from 1902 was entirely in converter steel.

The third table, given below, shows the total production of steel of all kinds in the United States last year, comparison being made with that for the preceding year, in which the maximum output was reached:

	1902	1903.	Changes.
Bessemer	9,138,363	8,577,228	D.561,135
Open-hearth	5,687,729	5,837,789	I.150,060
Crucible, etc.	121,158	121,000	D.153
Total	**14,947,250**	**14,536,017**	**D.411,233**

This shows a small loss—2.7 per cent—in the total, but the production still remains above fourteen million tons. The falling off

in bessemer output was entirely in the second half of the year.

No figures are attainable for the production of finished steel. Bessemer steel continues to be used largely for rails and bars, though the making of rails from basic open-hearth metal has been begun in Alabama. For structural steel, and very largely for plates, the open-hearth steel is now preferred, and for castings its use is very general. The open-hearth furnace is steadily gaining, and there is little doubt that, in a few years, it will displace the converter as our chief steel producer.

CONDITIONS IN THE ANTHRACITE INDUSTRY.

Certain sensational newspapers in screaming headlines not long ago were proclaiming the mighty efforts of their proprietor, who, as a fearless champion of the common people, was relentlessly smashing the so-called coal trust—that is, the combination, by ownership of stock, among the great anthracite mining and transporting companies. Little has been heard of late, however, concerning the suit brought against these companies through the Interstate Commerce Commission and noisily advertised. There was talk of the defendants being called before the Commission, which has as yet only heard the plaintiff's side of the case, some time in September, but now it seems that no date for a hearing is set, and the plaintiff's newspapers seem to have lost interest in the matter. The wherefore of this extinction of much red ink prophecy is beyond our ken; possibly recent political happenings have had something to do with it; possibly also the statement of witnesses summoned by the plaintiff that lower anthracite prices would, through the findings of the Anthracite Strike Commission, reduce miners' wages, may have cooled the ardor of the plaintiff, a notable advocate of high wages for men not in his employ.

Seriously, however, it would be a pity if the companies do not present their side of the case. There are substantial reasons for anthracite coal selling for more than in 1898, and it would not hurt the companies any to make a clear and concise yet comprehensive statement of the costs that help determine the price the consumer pays.

As regards prices of anthracite, it seems extremely possible that they may be lower next year. The great fall in the price of bituminous coal must have some effect, and another year of abnormal demand such as 1903 is not to be expected in a long time. The present plan of selling by monthly discounts during the spring and summer, also, is not to be regarded as finally established. It has worked remarkably well in years of great demand, but in this year of comparative quiet there have been complaints and suggestions that the scheme be modified. In fact, the anthracite trade is likely to see another illustration of a truth that should be well known by its strong men, that prices cannot be upheld long on a declining market.

Meantime, we may note that the consolidation of interests in the anthracite fields continues, and now probably less than 5 per cent of the total output of the mines is sold by independent operators. One after another, independent operators, tempted by liberal offers, make closer unions with the railroads, or retire by selling their mines outright, and thus the movement continues. Once more we would call attention to the fact that the organic growth of this great industry is governed by economic forces not easily stopped. The "trust buster" may shriek and politicians may "view the situation with alarm," but the tendency toward consolidation shown by the anthracite industry fifty years ago is still manifest to-day, and is likely to continue a power in the future in spite of the yellow newspaper and the man in search of votes.

ZINC TAILINGS AT BROKEN HILL.

We have at various times referred to the process for removing the gangue from the zinc tailings at Broken Hill by immersion in a saturated acid solution of salt-cake, and we have mentioned that the Broken Hill Proprietary Company has built a plant capable of treating 1,000 tons of tailings weekly. At the present time it will be of interest to enter into a discussion of one or two points in connection with this process, which warrants some attention.

As our readers already know, the process is a development of Mr. Potter's idea of bringing the zinc tailings into contact with a warm solution of acid, the effect being that the sulphides are buoyed up by the gas generated, while the gangue falls to the bottom. It was found advisable to modify this idea in some way so as to make the buoying action last longer, and this was done by increasing the density and viscosity of the acid solution by adding an inert salt such as salt-cake. This addition also had the advantage of economizing the consumption of acid.

As already mentioned, the process has been worked out on a practical scale, and concentration has been going on for some time, but it is only just recently that any of the concentrates have been smelted or sold to smelters. It is disconcerting to hear that the first parcel sold to Belgian zinc works has revealed an unexpected difficulty. It is found that the presence of salt-cake ruins the retorts by making a flux with the clay. In fact, the smelters will not buy any more unless the salt-cake is completely eliminated. How the difficulty is to be overcome is not quite clear at present. The cost of washing would be considerable, and in the zinc-lead industry, where the reduction of costs and economy in the various processes are of as great importance as in gold mining, any additional expense may be fatal. No doubt a large part of the salt-cake could be removed inexpensively, but the Belgian smelters insist on the absence of even a trace.

The consideration of this contretemps brings us back to the general economic history of the disposal of the Broken Hill output. In the early days the bullion was all shipped to Europe, and the various purchasers disposed of the refined pig lead through their usual trade channels. When the Broken Hill Proprietary Company established its own refining works and attempted to dispose of the lead directly, it encountered great opposition among metal merchants and brokers, and the lead was alleged to be of inferior quality. The Proprietary Company, therefore, looked out for new markets, and eventually established its trade on a sound footing in eastern Asiatic countries. It is possible the company may decide to pursue a similar policy with the zinc, seeing that European smelters raise objection to the concentrates. But it will be confronted with two difficulties. In the first place there is no local supply of suitable clay out of which to make the retorts, so that smelting at Port Pirie would be carried on under disadvantages, and secondly, the market for zinc is much more restricted than that for lead.

There are at present over four million tons of tailings on the dumps along the Barrier range, and they are continually increasing, the Proprietary Company alone adding 5,000 tons a week. These tailings assay about 6 per cent lead, 23 per cent zinc and 9 oz. of silver. After treatment by the salt-cake process the zinc contents are raised to about 45 per cent, the lead to 9 per cent and the silver to 12 oz. The exploitation of these tailings on a large scale would be impossible, owing to the difficulty of disposing of the products. In fact, a careful restriction of the amount treated, or the amount offered for sale to European smelters, would be absolutely necessary. It must be remembered also that the concentrates, even when quite free from salt-cake, are not of the quality most sought after by smelters. Altogether, the realization of the zinc values in Broken Hill ores is still a difficult problem for the future.

STANDARDS IN WASHING COAL.

Proximate analyses of coal showing fixed carbon, volatile hydrocarbons, sulphur and ash and fuel value in thermal units are of high value to the consumer, and also to the producer, and we hope the day is not far distant when grades will be bought and sold on a guaranteed analysis rather than on the strength of some sort of a trade name. In connection with this matter of coal analysis we call attention to the needs of producers for new data. One of the new developments in the coal industry is the opening of thin seams of poor quality in territory where thicker seams of better quality are not far distant. This development is due as yet not so much to the exhaustion of the good seams as to the high price of good coal

lands in districts convenient to our great manufacturing centers and the control of coal lands by great corporations. It is now cheaper in some localities for a newly formed corporation to get title to lands carrying thin, poor seams and use the latest methods of mining and preparing the coal than to get lands carrying coal seams more easily worked and made merchantable. This applies particularly to coking coals.

By washing the coal and by using ovens of improved type excellent coke can be made from seams that show very poorly on analysis. There can be no question, therefore, of a decided increase in the proportion of coke made from washed coal, and in the great extension of coal washing. The matter to which we call attention is the lack of any sort of standard by which results obtained in washing, particularly in washing rather finely ground coals, can be compared. Analyses of the run-of-mine coal and of the washed coal are valuable, but, owing to the variations in the physical structure of coals and the contained impurities, are not sufficient. What the superintendent of a coal-washing plant wants is a standard by which he can make a direct comparison between his work and the work of another man as published in the proceedings of some society or the columns of some mining publication—that is a standard specific gravity test.

It is customary to test the working of washing plants by using solutions dense enough to float coal; in this way the amount of heavy impurity in the washed coal and the amount of coal in the sludge can be determined quickly and with sufficient accuracy for ordinary purposes. The trouble is, when it comes to comparing results, that most papers on coal washing do not state what was the specific gravity of the fluid used.

While it is not possible to use fluids of the same density for all coals, yet it is highly desirable that the specific gravity of the fluid used should be stated. We call the attention of the superintendents of coal-washing plants and manufacturers of washing machinery to this important matter.

MARKET CONDITIONS.

Sept. 28.

The metal markets generally show an improvement in conditions which is gradual; but it is noticeable each week that the ground gained is fully held.

Copper shows a good demand, both for home consumption and for export, with somewhat greater firmness in prices. Tin has recovered from the temporary depression noted last week, and is firmer, with some improvement in demand. Lead is unchanged, both in consumption and prices. Spelter is quiet, and buying has fallen off to some extent. Ore prices in the Joplin market have again advanced.

Without showing any marked change, silver is a little stronger, and there is apparently a somewhat better demand from the East.

The iron and steel markets respond rather slowly to recent reductions in prices, but there is a perceptibly better tone, with many inquiries for material for future delivery. Upon the whole, the prospect is for a considerable improvement in trade, although it may come rather slowly.

The Western coal markets show an improved demand for steam coal, while the approach of winter puts the domestic market on a little better basis than it has been.

The seaboard bituminous market shows little change. Prices are firmer, but have not advanced. West Virginia coal continues to rule the market.

The anthracite trade shows some improvement in retail buying at certain points, but the wholesale trade remains quiet, and no great increase in demand is to be expected for some time.

METALLICS.

Culled from all sources. Our readers are invited to assist this department by sending similar material.

A discovery of native copper associated with gold, in quartz, has been made near Gungahleen, in New South Wales.

The world's coal production amounts to 790,000,000 tons, of which Great Britain produces rather less and the United States rather more than a third.

The Elmore oil process has dealt successfully with the concentration of fine particles of platinum and osmiridium occurring in 'black sands' from Ecuador.

The water struck in the Simplon tunnel in 1902 had a temperature of 113° F., and the air at the heading rose to 84° F. Since then this experience has been repeated.

Dividends of 1,150 per cent ($6,869,500) have been paid in 15 years, from 1888 to1903, by the Crown Reef Gold Mining Company, of the Transvaal, from 1,754,104 tons of ore milled, at an average cost of $7.15 per ton.

The tendency of modern thought is to banish cataclysms to the theological limbo, and to view nature as a sleepless plodder, endowed with infinite patience, waiting through long ages for results.

The world is assumed to be symmetrical; three sides of a square are supposed to imply the fourth side, and a broken arc of a circle "the perfect round." Sometimes this devotion to symmetry is based upon such ample knowledge as to be practically a complete argument; sometimes it is merely freakish, the method of a crank who believes that Nature runs into circles or figures of eight, or some such fantasia.

Anticipation in science is justified not only by its practical value as a means to discovery, but by the very constitution of our knowledge. If life in its different manifestations is an organic structure, governed by fixed and intelligible principles, then there must be a real similarity between its forms at different epochs.

OPEN-HEARTH STEEL PRODUCTION.

The American Iron & Steel Association has received virtually complete statistics of the production of open-hearth steel in the United States in 1903. The production was larger than in 1902 or any preceding year.

The total production of open-hearth steel ingots and castings in the United States in 1903 was 5,837,789 gross tons, against 5,687,729 tons in 1902, an increase of 150,060 tons, or 2.6 per cent. As compared with 1898, six years ago, when the production of open-hearth steel amounted to 2,230,292 tons, there was an increase in 1903 of 3,607,497 tons, or over 161 per cent.

The open-hearth steel made in 1903 was produced by 111 works in 17 States—Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, Maryland, Tennessee, Alabama, Ohio, Indiana, Illinois, Wisconsin, Missouri, Colorado and California. Ninety-eight works in 16 States made open-hearth steel in 1902. The States which have open-hearth furnaces, but which did not produce open-hearth steel in 1903, were West Virginia and Kentucky.

In 1902 4,496,533 tons of open-hearth steel were made by the basic process and 1,191,196 tons were made by the acid process, while in 1903 the production by the basic process amounted to 4,741,913 tons and by the acid process to 1,095,876 tons. In the following table the production by States of both acid and basic open-hearth steel ingots and castings in 1903 is given in long tons:

	Basic.	Acid.	Total.
New England	105,778	63,431	169,209
N. Y. and N. J.	71,537	33,061	104,598
Pennsylvania	3,557,493	884,865	4,442,358
Ohio	308,575	60,674	369,249
Illinois	390,513	32,406	422,919
Other States	308,017	21,439	329,456
Total	4,741,913	1,095,876	5,837,789

There was a decrease in the production of acid steel in 1903, as compared with 1902, of 95,320 tons, or a little over 8 per cent, but an increase in the production of basic steel of 245,380 tons, or almost 5.5 per cent.

The total production of open-hearth steel castings in 1903, included above, amounted to 384,809 gross tons, of which 134,879 tons were made by the basic process and 249,930 tons were made by the acid process. In 1902 the production of open-hearth steel castings amounted to 367,879 tons, of which 112,404 tons were made by the basic process and 255,475 tons by the acid process. The following table gives the production of open-hearth steel castings by the acid and basic processes in 1903 by States, in long tons:

	Basic.	Acid.	Total.
New Eng., N. Y. and N.J.	5,311	30,783	36,094
Pennsylvania	14,483	150,749	165,232
Ohio, Ill., and other States	115,085	68,398	183,483
Total	134,879	249,930	384,809

In addition to the States enumerated in the table, Massachusetts, Connecticut, Tennessee, Alabama, Indiana, Wisconsin, Missouri and California made open-hearth steel castings in 1903.

In the variety of its mineral products the Leadville district probably holds a unique position. No less than eight different metals are mined and shipped as individual products; the list including gold, silver, lead, zinc, iron, copper, manganese and bismuth. Last year the district ranked first among the camps of Colorado as a producer of silver, lead and zinc, second in its production of copper, and fifth in its gold output.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of THE ENGINEERING AND MINING JOURNAL.

PYRITE SMELTING.

The Editor:

Sir—The following additional notes may be of service: We find slags below 5 per cent in lime chill quickly, and that slags above 10 per cent in lime do not separate out the values so well as when kept below 10 per cent lime. A 7 to 8 per cent lime slag is ideal. On cleaning flues we found the cold blast made more than double the quantity of flue-dust made by the hot blast, and, worse still, the cold blast flue-dust from the same ores contained double the values of the hot blast flue-dust. Altogether, as compared with hot blast, the cold blast runs were miserable and expensive failures. In July we had another freeze-up on cold blast. The July run showed a trifle better in coke consumption (10.5 instead of 11 per cent), but the ore charged was only 30 tons per 24 hours and the matte outfall was unsatisfactory. However, with July our cold blast runs came to an end—for which we are truly thankful. This month we hope to run with hot-blast, gas-engines and modern appliances and leave behind us the Paleozoic period of cold blast and steam engines. With hot blast, gas-engines and electric transmission, the twentieth century smelter has a brilliant and economical future.

WALTER E. KOCH.

Santa Maria del Oro, Sept. 2, 1904.

TITANIFEROUS IRON ORES.

The Editor:

Sir—I have read with a great deal of interest in your issue of September 1 an abstract from the paper of Dr. Hulst, read before the Lake Superior Mining Institute last month, on titaniferous ores.

Deriving necessarily most of his information from what has been published for the past thirty years on this matter, he recalls the objection made against their use in the blast furnace, "the greater amount of fuel required," the "titanium deposits," the alleged "infusibility or pasty consistency of slags" from mixtures containing but a few per cent of titanic acid (2 per cent or thereabout), mentioning the attempts made in Canada, Sweden and England to smelt them, or at least referring to them. As he has done me the honor to quote me, and as he treats the subject as a metallurgist not blindly influenced by deep-rooted prejudices, but as one giving impartially both sides of a question, I may be allowed to answer to some parts of his paper in your columns, with all due appreciation of his comments.

First, as to the attempts made in England, in two furnaces at Norton, by Dr. Forbes. I would call attention to the fact that the titaniferous ores smelted there, without mixture, were an ilmenite from Norway, containing, from analysis furnished by the chemist in charge (Mr. Wm. Bowron), 39.20 per cent TiO_2, 5.70 per cent SiO_2, with about 4 per cent earthy bases, or, say, 50 per cent gangue, with only 35 to 36 per cent metallic iron. This appears from a paper published by Mr. Bowron in the *Transactions* of the American Institute of Mining Engineers,[1] and is confirmed by a letter of Mr. Bowron to Mr. James MacNaughton (dated 1888), in which he states emphatically that these ores were smelted "without mixture." He gives in his paper the charges of the furnace, coke, calcite, ores and special silicious fluxes, considered then by Dr. Forbes as necessary, with analyses of all the materials and of the slags, from which it results that there was, in round numbers, per ton of pig iron, 3.25 to 3.5 tons of slag. Furthermore, in a paper read before the Iron and Steel Institute,[2] Mr. Jeremiah Head, mentioning these Norton furnaces, states that "they had a fairly successful career of six to seven years, . . the iron going to Sheffield markets for high-class purposes."

Second. The Taberg ores of Sweden[3] contained 6.30 per cent TiO_2 (from other analyses 10 per cent), with only 31.45 per cent Fe and an enormous amount of magnesia, 18.30 per cent, and silica 21.25, or say, again, some 50 per cent gangue.

Third. In Canada the ores smelted for a short time came from St. Urbain, Baie St. Paul. They analyzed 40 to 48 per cent TiO_2 with 36 per cent or less of iron and 10 per cent earthy bases and silica; that is, again, about 50 per cent gangue.[4]

However successful, metallurgically speaking, the smelting of these ores may have been, can they be taken as a criterion of the economy of fuel? Is it fair to compare them, on this score, with ores containing 57 to 60 per cent metallic iron or more? Would not ores free from TiO_2, but containing as much gangue as 50 per cent with silica, give similar uneconomical results?

But many titaniferous ores are much richer in iron; the Adironack ores, for instance, among others, contain 56 to 62 per cent iron with 10 to 18 per cent TiO_2 and 3 to 5 per cent earthy bases and silica. Official records show that iron was made from such ores by the Adirondack Iron & Steel Company in the wilderness as early as 1840, and for some twenty consecutive years. We read in Mr. Kemp's report:[5]

"About 1840 a small blast furnace was erected, of five tons' daily capacity, and some years later a larger one, of 12 to 15 tons, together with puddling furnaces and the necessary machinery for making bar iron. This latter stack is still standing. The furnace went out of blast about 1859, and the enterprise stopped, after having been in operation 15 to 18 years, during which the manufactured iron made its labored exit to the markets by means of teams to Crown Point (Lake Champlain), some 50 miles distant. The expense of haulage proved too serious. The early promoters of the enterprise have found enduring memorials in the local geographical names, Henderson, Colden, McIntyre. . . . So far as we know, these comparatively primitive furnacemen found no difficulty in smelting these ores." I may add that the death of the principal promoters, the advent of the Civil War ('61), and the competition of new furnaces better located contributed to their abandonment.

Steel was made for the first time in the United States from this iron, and the iron and steel made from these ores won the prize medal at the Universal Exhibition in London in 1851. Reports (in my hands) from the United States Navy Yard, Washington, March 25, 1850, and from the United States Armory, Springfield, Mass., March 4, 1850, duly authenticated, testify to the excellence of this steel.

All these furnaces were of the old type, some of them with open tops, with a poor utilization of the gases, working with blast at low temperature and pressure. Can the economy of fuel under such conditions be argued against these ores, very low in iron as they were (excepting the Adirondack ores), by the metallurgist of our days? We have only to compare the duty in coke of our modern furnaces with the best English furnaces of the old type.

At any rate, had these furnaces been clogged up by titanium deposits, by pasty and ropy slags, and had these slags contained some 35 per cent TiO_2, and not 2 per cent or less, as analyses show, can we admit that the Adirondack Iron & Steel Company would have kept their furnaces running for eighteen years, building stack after stack, putting up puddling furnaces; that the English furnaces at Norton should have had "a fairly successful career of six or seven years," even if these runs were uneconomical as to fuel, owing to the leanness of the ore or conditions of furnace?

It is conceded by the most persistent obstructionists that the pig iron made from titaniferous ores is excellent—remarkably good. I read in the paper of Mr. Jeremiah Head, quoted above, "that it has an unusual degree of toughness," that it is "a splendid iron," "all that can be desired," as stated by Dr. Riley, that it is "an ideal open-hearth stock."[6]

Whatever may be the causes, whether absence of phosphorus and sulphur, or specific and indirect action of titanium, the fact remains that this pig iron has valuable properties for certain applications, and could it not then command a slightly higher price on the market, sufficient to offset even the increased cost in fuel? We should bear in mind also that all the titaniferous ores smelted were of the magnetic type. I submit this question of smelting to the progressive spirit of American and impartial metallurgists. Is this unfavorable verdict sustained by actual facts? Has it ever been confirmed by the competent blast furnace men of our days, under favorable conditions as regards ore, temperature and pressure of blast?

Let us ascertain to what the increase of fuel is due, bearing in mind that we deal with magnetites. Titanic acid is not reduced by carbon to any extent at the temperature prevailing in a blast furnace; otherwise ores like the Norway ilmenite or the Baie St. Paul ores (Canada), containing some 39 per cent TiO_2, would yield an iron containing more titanium than ores which analyze only one or two per cent TiO_2. The pig iron from Baie St. Paul ores contained only 0.00 per cent, 0.03 per cent, 0.05 per cent, 0.26 per cent, from analyses made at the Paris School of Mines (see Obalski report quoted above). The pig iron made from the Adirondack ores (10 to 18 per cent TiO_2) showed about the same percentage, 0.07 to 0.03. As far as I have been able to experiment in this line, the heat of formation of TiO_2 is about 60 per cent to two-thirds that of alumina, and nothing short of the heat of an electric furnace will cause carbon to reduce TiO_2. If it is so reduced in a blast furnace to the small extent to which it is found in pig

[1] Wm. Bowron, American Institute of Mining Engineers, Vol. XI, p. 159 *et seq.*

[2] 'Scandinavia as a source of Iron Supply,' by Jeremiah Head. Iron and Steel Institute, Annual spring meeting, London, May 1894.

[3] 'The Titaniferous Ores of the Adirondacks,' by James F. Kemp. 19th *Annual Report*, United States Geological Survey 1897-98. Part III. 'Economic Geology,' p. 388. Analysis No. 20.

[4] 'Mines and Minerals of the Province of Quebec.' 1889-1890, p. 28. J. Obalski, Government Mining Engineer.

[5] 'Geological Survey of the State of New York,' 15th Annual *Report*, 1895, pp. 607-609. James Hall, State Geologist; J. F. Kemp, Asst. Geologist.

[6] Discussion of A. J. Rossi's paper by Dr. W. B. Phillips, American Institute of Mining Engineers, Vol. XXI, p. 867.

iron, it is due to other causes and conditions, which I have studied and tried to elucidate.

A good ore, any hard hematite from Lake Superior, which I smelted in my small Buffalo furnace[7] before using titaniferous ores, contained: 57.50 to 62 per cent iron, an average of 60 per cent, and 15 per cent gangue; the titaniferous ores I used (Adirondack ores), 56 to 58 per cent iron and about 20 per cent gangue. If we consider that the same amount of CaO (56) will saturate, for the same oxygen ratio, in round numbers, 80 of TiO_2 as against 60 of SiO_2, we see that the amount of flux to be added to 100 lb. of the two kinds of ore will be smaller for the titanic acid slag than for the silica slag; so that, practically, the Adirondack ores, or similar ores, would not give any more slag than the Lake Superior hematite per ton of pig iron obtained. Can we admit *a priori* that the difference of heat required to melt each kind of slag, the amount of which is small in both cases per ton of pig, can possibly make such a difference in the amount of fuel as to be practically of such an account as to be called exclusive? As to the oxide of iron in the ores, let them be titaniferous or not, if it is of the same type, its reduction taxes the furnace to the same extent. I desire it to be understood that when I speak of smelting titaniferous ores I speak only of such ores as can compare for percentage of metallic iron with those used now in blast furnaces—that is, rich ores.

It is easy for any one to be convinced of the fusibility of titanic slags by repeating my own experiments; titanates, or titano-silicates are quite fusible and give fluid slags. I have given examples of mixtures of Al_2O_3, CaO, MgO, SiO_2, TiO_2,[8] in which the silica diminishes to less than 1 per cent, while the TiO_2 increases from 0 to as high as 40 to 45 per cent, and, in some later experiments, even to 63 per cent TiO_2, and the slags melted in a crucible in a furnace with natural draft, and even the most extreme mixtures, not to be met in a blast furnace, would have melted in a blast furnace. They certainly proved to do so in my test furnace at Buffalo (see *Iron Age* article), and they contained 35 per cent TiO_2, 16 per cent silica, with lime, magnesia and alumina as bases. They ran 50 ft. from the furnace (a bulk of slag hardly 350 lb. at a time), as has been witnessed by the experienced furnaceman who helped me in my run. These slags were soluble in HCl in that fusion, the solution gelatinizing by evaporation, thus indicating plainly a chemical combination, because TiO_2 in the free state is not soluble in HCl any more than silica is.

These titaniferous ores are generally quite free from phosphorus and also sulphur; they occur in many States and in Canada as immense deposits, in "mountain masses," to use the expression of some geologists. One of the most marvelous in the United States, according to Mr. Birkinbine,[9] occurs in the Adirondacks (New York). It is the property of the McIntyre Iron Company (formerly the Adirondack Iron & Steel Company); it covers a surface of some 80,000 or 90,000 acres, "underlaid by such ores" to quote the *Report* of the New York Geological Survey in 1841. These ores could be mined by quarrying for several years. Is it creditable to our progressive century that the verdict against ores, so abundantly found, a verdict taken at second-hand, without any direct attempt to work them, or even personal investigation of the matter, should be recorded as definitive? Did I not hear of such prejudices for years against the use of dolomite or dolomitic limestone as flux, instead of calcite in a blast furnace, and now! At the Boonton Iron Works (Fuller, Lord & Company), as early as 1868, we used dolomite (much cheaper for us) in my two furnaces, instead of calcite, and still I could read coming from such an eminent metallurgist as Percy:[10] "The use of dolomite as a flux, instead of calcite, should obviously be avoided. This substance (magnesia) tends to induce infusibility." I tried it nevertheless, and I had slags carrying 15 to 18 per cent MgO, perfectly fusible of course.

I never observed titanium deposits in my small Buffalo furnace; I went inside the old larger stack in the Adirondacks—none were visible. Were they such as to clog or stop the operation of a furnace, could the Adirondack furnaces have run for some 18 years, the English Norton furnaces for six or seven years, my small furnace in Buffalo for months?

I thank Dr. Hulst for his appreciation of my work when he says: "There is no reason to doubt that he (Mr. Rossi) can duplicate his work in a large furnace." Dr. Hulst adds that my experiments, and I may add the runs of others, do not seem to have proved convincing. But how could it be otherwise? These ores, for years, have been ostracised and the prejudices against them handed down, without confirmation, from one blast furnace manager to another. These objections, right or wrong, have found their way into technical papers and books, and thus have reached a young generation of students in metallurgy, who believe them to be justified, as some of these statements came from authorities not so liberal-minded as Dr. Hulst.

I thank Dr. Hulst also for his conclusion when, having spoken humorously of the "objectionable" small dose of TiO_2, as not encouraging the use of a "killing one." He adds: "Yet this is what has been demonstrated in the basic process." It is the remark of a progressive scientist, who knows that what was considered impracticable some years ago may prove quite feasible or opportune in our days, with the development of science and industry. I do not pretend to have covered all the ground, but nobody, I believe, will contest my conclusion that: Were the smelting of the richest titaniferous iron ores to be once demonstrated under proper conditions to prove as economical and successful practically as that of other iron ores, these ores, occurring as they do in commercial deposits in many States, being particularly free from phosphorus and sulphur, quite rich in iron in many districts, cheaply mined in several others, and capable of yielding a pig metal conceded to possess valuable qualities, could, at no distant day, constitute a precious resource of supply, either used alone or in mixture with others.

I have said nothing in the above of the use of these titaniferous iron ores for making alloys of iron and titanium. Ferro-titanium of different percentages, added in very small quantities to cast iron and steel, has been found to increase considerably the toughness and strength of the metal. I have manufactured these alloys electrically by the ton, but this is a subject not germane to the present discussion, except in so far as it implies another application of these ores.

AUGUSTE J. ROSSI.

New York, Sept. 26, 1904.

[7] 'Smelting of Titaniferous Ores.' *Iron Age*, February 6, February 20, 1896, p. 12 *et seq.*

[8] *Transactions* American Institute of Mining Engineers, Vol. XXI, pp. 851-856.

[9] *Transactions* American Institute of Mining Engineers. Vol. XXI, p. 277.

[10] Percy's 'Metallurgy Iron and Steel,' London, 1864, p. 507.

THE LAKE SUPERIOR MEETING OF THE AMERICAN INSTITUTE OF MINING ENGINEERS.

SPECIAL CORRESPONDENCE.

The first session of the eighty-seventh meeting of the American Institute of Mining Engineers was called to order by the president, Mr. James Gayley, at 10 a. m. Wednesday, September 14, in the assembly room of the Commercial Club at Duluth. The Mayor, Dr. Cullom, and Mr. Joseph Cotton delivered addresses of welcome. Mr. Cotton said in part:

"Only thirty years ago, Minnesota was unknown in the world of iron and steel. Her rich beds of iron ore lay all undiscovered. Her fertile prairies and vast forests were only the destination of the Western emigrant and the Michigan lumberman. To-day the fame of the Mesabi and Vermilion ranges is world-wide, and Minnesota ranks first in the production of iron ore. The iron industry is one of the principal industries of our commonwealth, of our city and county, and of which we are justly proud. It gives employment to thousands of men and is aiding us to build up a virile young city."

The president replied briefly, and pointed to the great strides taken by Duluth in recent years, due largely to the improved transportation facilities by water and rail, and the accompanying cheapening of rates. Dr. Raymond, secretary of the Institute, was then introduced. In a witty speech he told of his earliest visit to the site of the present city of Duluth, and spoke of the brilliant future of the growing city. Referring to Mr. Cotton's suggestion that Duluth may be destined to be the commercial center of the North American continent, and eclipse the city on the island of Manhattan, he prophesied that, should Duluth ever become the center of our continent, by that time New York would be the center of the universe.

After announcements by the president, the presentation of papers was begun. The secretary stated that the Institute had lost 60 members by death during the last year, and that notices of these deceased members would appear in the next volume of the *Transactions*. The secretary then read an appreciative biographical notice of the late Prof. W. H. Pettee, one of the oldest and most active members in the Institute. Prof. Pettee was especially helpful in many ways to the secretary's office on account of his wide range of knowledge and painstaking care in the revision of papers designed for the *Transactions* of the Institute.

The second paper presented was on 'Centrifugal Ventilators,' by Mr. R. V. Norris, of Wilkes-Barre, Pa. The secretary, in the absence of the authors, then read the following papers: 'The Case of Henry Cort,' by Charles Morgan, Worcester, Mass., and the 'Genesis of the Diamond,' by Gardner F. Williams, general manager of the De Beers Company. In the afternoon the members of the Institute were taken in steamers and launches to inspect the concrete construction of the government piers at the Superior entry, returning by the Duluth canal to see the construction of the bridge in-

tended to span the canal. In the evening a reception was tendered the members by the Northland Golf Club at the club house.

At the session on Thursday morning the presentation of papers was continued. A paper on 'Some Special Forms of Blast Furnace Charging Apparatus,' by T. F. Witherbee, Durango, Mexico, was read. The secretary then, in the absence of the author, read a paper by Mr. David Baker, of Philadelphia, on 'Some Requisites for Obtaining Better Results from a Modern Blast Furnace.' These two papers were then discussed together, the following gentlemen participating: Mr. B. F. Fackenthal, Jr., Dr. Raymond, Mr. Julian Kennedy, Mr. Croxton, Mr. Gayley and Prof. Osann, of Clausthal, Germany. There seemed to be a general agreement among those discussing the papers that it is very doubtful if there are any essential advantages to be derived from the use of special forms of furnace-charging apparatus. Mr. Croxton, of the Cleveland Furnace Company, particularly brought out the fact that he had made accurate tests on a furnace under construction just before it was blown in, and described his method of making the test. Perfect distribution was obtained during the test, but this distribution did not hold out afterwards in practice, owing, as Mr. Croxton suggested, to varying amounts of moisture in the ore, slight shifting of the bell and other factors. He doubted the possibility of a mechanical arrangement which would give perfect distribution during winter and summer and during wet and dry weather. Prof. Osann suggested that the key to the difficulties supposed to result from the charging of the furnace was, in his opinion, to be sought in a solution of the reaction which occurs in the breaking down of 2CO into C + CO_2. As he stated, it was easy to theorize upon the reasons, but difficult to prove your theories. He believed it was something to do with this reaction which caused the slips in the blast furnace.

An interesting paper was then read by Prof. C. K. Leith, of the University of Wisconsin, entitled, 'A General Account of Lake Superior Geology, with Special Reference to the Districts to be Visited in Connection with this Meeting.' At the close of this paper various questions were asked the speaker, by Mr. T. F. Cole, Dr. N. P. Hulst and Mr. W. N. Merriam, in regard to the meaning of special geological features in the various districts. The meeting then adjourned and the members were taken in launches up the St. Louis River to the Zenith Furnace Company's plant. Here lunch was served and the members were given the opportunity of inspecting a modern by-product coke plant and blast furnace, situated in close proximity to the source of the iron ore, but remote from the coal-fields, in contradistinction to the usual blast furnace plants of the United States. Thursday evening the visiting Institute members and the local members left Duluth in two special trains for the Vermilion iron-bearing district.

Friday morning was spent on the hard-ore range at Ely examining the great trough in which the ore deposits occur, inspecting a new steel shaft-house, and in visiting the Pioneer mine to note the caving system by which the ore is won. In the afternoon the Mesabi range was reached, and some of the great mines on the east end of the range were seen, for example, the Biwabik, the Fayal, which has produced in one year over 1,900,000 tons of high-grade ore, the Adams, and the Mountain Iron mines. In these mines are illustrated the open-cut method of mining the ore, by loosening with powder and loading with steam shovel directly into the cars, which are run down into the pit, and the milling system of mining. The evening of Thursday was spent at Hibbing. A short but most enjoyable part of the evening was devoted to a social good time in one of the halls of the town.

Saturday, September 17, the special trains were taken to the great new Stevenson open-pit mine, which, though just opened, will probably get the record for tonnage shipped in 1904. The Mahoning mine was next visited. Here the members were provided with a lighter train, which could be hauled in and out of the great open pit. In this train the Mahoning and Sellers open pits were inspected in a very comfortable manner. In the afternoon the Burt, Clark, Monroe-Tener and other properties were seen. During this day an area was visited which is pretty well opened up by mines, and in which there is an enormous amount of ore in reserve. This area, extending approximately 2.5 miles east from the Mahoning mine, and averaging perhaps a half mile in width, is known to be underlain by a practically continuous mass of high-grade ore, running in places up to several hundred feet in thickness, as shown by drill tests. Both underground and open-pit methods are used in mining this ore. In the open-pit work the mining companies are stripping overburden, which runs up to 90 ft. in thickness. The mode of occurrence and immensity of these iron ore deposits was a revelation even to some of the visiting members of the Institute from the United States. Nine German engineers, guests of the Institute, were particularly impressed. In the late afternoon a return was made to Duluth, and the following day, Sunday, was spent by the members in such ways as best suited their pleasure. Some of them visited the steamer *August B. Wolvin*, of 10,350 tons capacity, the largest ore-carrying steamer in the world, while still others enjoyed the celebrated boulevard drive, which is laid out upon an old, abandoned Lake Superior shore line terrace 500 ft. above the present lake level.

Monday, September 19, found the special trains carrying the members of the Institute at Houghton. A two days' stay was made in the copper country. During this period the local committee kept the visitors seeing the various mines, mills and smelters on schedule time, and at such a rate that the capacity of the visitors to mentally digest the interesting and instructive things seen was about overtaxed. Especially were the visiting engineers interested in the elaborate and new types of machinery installed at the various plants, for instance, at the Red Jacket shaft of the Calumet & Hecla, and at No. 5 of the Tamarack, and in the mills of the Calumet & Hecla Company. The latest type of smelter in this district is the Michigan smelter, on Portage lake, designed by Frank Klepetko and modeled in general on the plans of the latest large western smelters. It embodies the very latest devices for economizing labor, fuel, etc. The visit to Houghton was closed by the inspection of the College of Mines. This school is growing steadily and adding to its equipment, and is doing a very important work in the copper district of Michigan, while its influence is felt far beyond the boundaries of the State.

Wednesday, September 21, the visiting members arrived in Ishpeming, on the Marquette range of Michigan. They were first taken to the Pioneer furnace of the Cleveland Cliffs Iron Company, at Marquette. Here they inspected this modern charcoal furnace and charcoal by-product plant. The return to Ishpeming was made at noon, and the Institute was entertained at lunch at the Wawonowin Golf Club house. The afternoon was spent as the desires of the individual members dictated. Parties were made up to go underground, others examined the surface work, while still others devoted themselves to recreation. At 10 p. m. the special train left the Lake Superior region, carrying with it the majority of the members of the Institute who had assembled on the first day at Duluth. The members separated at Milwaukee and Chicago, a small body continuing to St. Louis for the special session there on Monday, September 25, which was to be devoted largely to the Louisiana Purchase Exposition.

The supplementary meeting of the Institute in St. Louis was held in the Assembly Hall of the Mines Building, September 24. Addresses were made by President Francis, of the Exposition, and by Professor J. A. Holmes.

Abstracts of the following papers were presented:

'The United States Geological Survey Fuel Testing Plant in the Mining Gulch at the St. Louis Exposition,' by E. W. Parker, of Washington, D. C.

'The Lead Resources of Missouri,' by Arthur Thacher, of St. Louis.

'The Zinc Smelting Industry in the West,' by Hermann C. Meister, of St. Louis.

'Ore-Dressing Practice in Missouri,' by O. M. Bilharz, of Flat River, Mo.

'The Coal Resources of Missouri,' by B. F. Bush, of St. Louis.

'The Joplin Zinc District of Missouri,' by B. F. Bain, of Washington, D. C.

'The Fireclays of Missouri,' by H. A. Wheeler, of St. Louis.

In the morning, before this meeting, many members attended that of the Mining Section of the International Congress of Arts and Sciences. Addresses were made by Professor Robert H. Richards, of Boston, and Professor Samuel B. Christy, of California.

In the evening a reception was given, in the Missouri State Building, to the members of the Institute by the St. Louis Engineers' Club.

The province of Ontario now supplies a large part of the feldspar consumed in this country. The quarries are situated in southern Ontario, near Kingston, Petrolea and Verona, and their output in 1903 amounted to 15,296 tons, which is somewhat larger than the production in the United States for the same year. Attempts have been made to introduce Ontario feldspar into England, but so far they have not been successful.

The winding ropes in use in the Dortmund mining districts in Germany are almost exclusively round and of crucible cast steel. At 126 collieries in 1902 there were only 40 flat ropes, which were made of cast steel, as compared with 408 round ropes of the same material. During the year eight ropes were replaced owing to fracture, one flat and seven round ropes having broken when in use. The maximum work done by any one of the ropes that broke was 399,280,000 kilogram meters, as compared with 791,110,000 kgm. in 1901.

RADIUM.*

Radio-activity is a property of matter specially predicated of five bodies, the recent study of whose attributes has threatened the traditional foundations of certain branches of physical science. Only speaking here of radium, which is sufficiently typical of the group, we fall at starting into the position of the cook of the immortal Mrs. Glass—to make hare soup, "first catch your hare." Now, although 'radium' (so-called) is advertised to let on hire, while its bromide is sold in five-milligram tubes, costing about $40 each, the actual hare has never been run down, even in the refinery built and fitted at Ivry, by that cunning Polish analyst, Madame Curie, and her ingenious French husband. A cartload of the composite mineral known as pitchblende, being made to yield up its chief ingredient—viz., uranium,—dwindles down to a ton of a refuse of mixed ores, which, by roasting, washing, precipitating, crystallizing, fractionation, and other factory and laboratory processes, is reduced to a few specks of final residue. But this is not our hare. The analyst will have arrived at a radium salt, probably the chloride, bromide or nitrate, but he is still far from radium itself, which has not yet been isolated. On this fundamental fact that profound savant, Professor Rutherford, whose researches have done so much honor to his natal New Zealand and his Canadian university, contradicts a cloud of witnesses, among whom are M. Curie, and a German, whose *ipsissima verba* show that he has *not* achieved the isolation assumed. In expert language, the term 'radium' designates, as a rule, the bromide of our cryptic element, or maybe its chloride. Of the last-named salt, eight tons of the red pitchblende residue will yield fifteen grains (about a salt-spoonful), worth $125 a grain; the bromide may run up to a selling value reckoned at eight thousand times the price of gold.

We now beg to explain that in radio-active inquiries the word 'ray' must be read in its Newtonian, corpuscular sense, otherwise confusion is caused by its use. In the case of light and heat, radiation signifies the passage of transverse vibrations through the ether of space. Applied to radium and to certain of its congeners, that word virtually means that a stream of material bodies from the radio-active source is impinging with great velocity on exterior objects. Radium, thorium, polonium, and uranium emit diverse particles of this description, which have been grouped as the alpha, beta, and gamma 'rays.' The α-rays can penetrate at most a sheet of paper, or a trifling layer of air, or a thin leaf of mica; and if made to travel into a magnetic or electrical field they bend off a little to the left. The β-rays have much more penetrative power, and are violently deflected from their path to the right by an electric current. The γ-rays will pierce a foot of iron; unlike their neighbors, they entirely ignore magnetic fields, however intense, and they bear a family likeness to the Röntgen, or X-rays. Another stumbling block of radio-active nomenclature is the expression 'emanation,' which is often used in a very lax manner as the equivalent of 'rays.' Whereas other substances have to remain at rest, radium, says Professor Rutherford, with emphasis, "has the power of constantly emitting into the surrounding space a material emanation which has all the properties of a radio-active gas." The 'emanation,' however, is not singular, but plural, for it emits a product of its own called emanation X. This secondary article also alters its ways, and heads a series of successive changes, the last of which will arrive two hundred (?) years hence; while to the final link in this chain Professor Rutherford's exact table assigns no date. Sir W. Ramsay infers from spectroscopic evidence that his own sun-gas, helium, now found in terrestrial sources, is present in the first emanation—or are we to say in the X-rays?—or, perhaps, in the original radium atoms, which some guessers at truth therefore identify with helium.

The luminous qualities of our veiled sphinx are traced to the X-rays, which are exhibited in full activity by the spinthariscope of Sir W. Crookes (whose 'tubes' led the way to more than one path through what he has finally called "the shadowy realm between Known and Unknown," and, in particular, to the discovery of the Röntgen rays). Opposite a phosphorescent metallic screen fixed in a little brass box is poised a needle or watch-hand, which has been dipped into a solution of radium-nitrate. Viewed by the help of a magnifier through a hole in the box, the screen appears as a target for successive flights of falling stars, an effect ascribed to the breaking up of the surface of the screen into minute crystals by the particles which reach it from the radiant needle. According to the laws of heat, as another authoritative writer on the subject well puts it, "however hot a body may be it will finally become of the same temperature as its surroundings." Contrariwise, the rebel radium persistently keeps up its temperature several degrees (M. Curie says 5° F.) above that of the neighboring objects, and, what is still more startling, if exposed to the abysses of cold which convert hydrogen into a liquid, radium meets the situation by throwing out heat in larger volumes than before. Compared with the million years allotted to grains of uranium and thorium before they reach their vanishing point, the life of radium is short: still, a radium electroscope recently designed would go on automatically ringing a bell for thirty thousand years. In quantitative vigor, however, radium is three hundred million times ahead of its strongest rivals, a calculation less intelligible than the fact that two pounds of the article would suffice to take a large liner across the Atlantic.

Radium, then, never ceases to emit energy in the form of light, and is perpetually bombarding its surroundings with minute particles of its substance, acting at the same time as a regenerative furnace, which, though without apparent apparatus for renewals, is warranted to retain its heat energy for more than two thousand years. Professor Rutherford and Mr. Soddy, behind whom is arrayed a powerful phalanx of scientific opinion, offer an ultra-hypothetical solution of this double conundrum. They allege that the corpuscles of the radium atom are constantly colliding, thus developing a state of chronic friction and disruption competent to furnish the phenomenal energies of heat and motion which the radium displays. This belief, though accepted with considerable limitations by Sir W. Crookes, is repudiated as revolutionary by Lord Kelvin, who will not even entertain the idea of the disintegration theory as a working hypothesis. Noting the Curie-Rutherford estimate of the tremendous pace at which radium spits forth heat for about a year, the veteran "head and front" of British, and, indeed, of European, physical science, says that if this amazing emission really lasts month after month, fresh energy must somehow be supplied from without, otherwise the calometric apparatus of the atoms must fall out of working order. In other words, the requisite stoking is done by the waves of the ether which bring the furnace fresh loads of energy *ad libitum*. Still more conservative are the eminent M. Berthelot and his followers, who assert that the new radio-activity is possessed by almost all known bodies, and that radium, like phosphorus, receives its energy from the sun. The loose state of the radium terminology aggravates the difficulties of both teacher and learner when they reach the depths of certain Dom Daniel caves of speculation which are linked to the explosion theory. Dalton would grieve to hear that his sacrosanct indivisible atom, far from being a simple body of ultra microscopic proportions, is a complex system of detached particles of electricity called electrons. At times one of these particles will go astray, creating minute entities known to Faraday as *ions*, or carriers of electricity, and now identified with the α and β rays. Then such atoms as are in the transitional state are classed by Professor Rutherford as metabolons, or changers—a term also applied to the emanations and other products of radio-activity. This chapter of atomic history has just been treated by Sir Oliver Lodge, whose latest views on the 'Electron Theory of Matter' are given in a short article which, strange to say, has been pitchforked into the "summer fiction number" of *Harper's*. Putting up the shutters on the ions and metabolons, he adopts Professor Thomson's electron as the constituent of the atom of ordinary matter. Of typical atoms, a million million millions could be crowded tightly into an apothecary's grain, the whole edifice being full of minute specks of negative electricity, *alias* electrons. This view is not simplified by a recent remark of the eminent electrical specialist who presides over the National Physical Laboratory. Professor Glazebrook's dictum is, "We at present have but little idea of what an electron is."

The accepted figures of the duration of the sun's life and of the probable age of our earth as a habitable world are seriously compromised by this new phase of science. The French estimates of the healing virtues of radium are more favorable than those of our own surgeons. The firebrand activities of the α and β rays are well illustrated by the terrible London experiences of MM. Becquerel and Curie when they handled their minute tubes at the Royal Institution with careless confidence, and the rays may fatally injure the spinal cord and the eyesight. They kill mice and bacteria, prolong the life of grubs to three times their natural term, can give vitality to the *unfertilized* eggs of sea-urchins, and transform tadpoles into monsters unknown to zoology. *Il y a fagots et fagots.* Pitchblende "of sorts" is obtainable in Cornwall and America. But the real article, though cropping up in small lodes in Saxony, has not hitherto been produced in quantities except at the State mines of Joachimsthal, and the Austrian Government has lately laid an embargo on the ore. When the European stock of 'radium,' now written at 50 to 60 grains, has increased, say a thousand-fold, and the price falls to one thirty-two-thousandth part of its present figure, the labors of Montreal, Cambridge, and Ivry may force the sphinx finally to drop her veil.

*Abstracted from *The Spectator*, London, August 20, 1904.

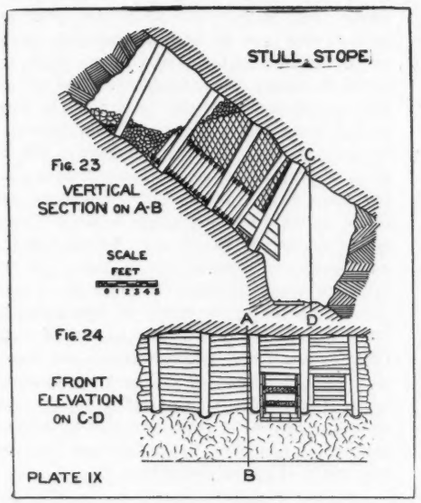
The deepest bore-hole in the north of France coal-field is at the Béthune mine—4,340 feet.

TIMBER AND TIMBERING.

By J. H. Batcheller.

(Continued from page 469.)

In closing the comments directed solely to stope timbering, there are some interesting points worthy of comparison between the 7-ft. clear sets used in the Bunker Hill & Sullivan Company's mines, and the 6-ft. clear sets used by some other mining companies. It must be remembered that in each case the thickness of the flooring planks must be deducted from these measurements, which leaves these sets with 6 ft. 9-in. walking room, as against 5 ft.



9 in. in the clear for the others. The longer posts give greater efficiency to the working powers of the men in the stope. For example, only an exceptionally tall man would be unable to walk erect, with timbers or steel on his shoulders, in a 6 ft. 9-in. clearance. Furthermore, angle-braces frequently have to be put in where a passageway is being used to reach a chute. A 7-in. angle-brace put in across a 7-ft. square-set, still leaves room for a man to run the average sized iron wheel-barrow under it; while the same timber between 6-ft. posts would stop the way.

As a matter of economy, the longer posts are desirable. It would take only 41 posts 7 ft. 10 in. long to gain a vertical height of 321 ft. 2 in., against 47 posts 6 ft. 10 in. for the same distance. This means a total saving of 6 long posts, or of one 7 ft. 10-in. post in every 53 ft. 8 in. In a stope of given height, there is not, of course, any saving in the number of feet of timber put in vertically, but the use of the longer posts saves the cost of one complete floor for the whole stope,—caps, ties, general material, and labor—in every 53 ft. 8 in. vertical.

Plate IV needs but little comment. The battered tunnel-sets are the cheaper, both in material and in the amount of ground necessary to be broken out. The posts are frequently given more batter, where the ground is softer and has more side weight. The drawing represents the minimum amount.

Since they are not put up on sills, battered sets are not used in places where the floor will be worked out from below. The straight tunnel-sets have top and bottom spreader boards spiked to the caps and sills. There are several sizes used in the mines, varying slightly in the height of the posts as well as the dimensions of the timbers. The choice of a given size is governed by the place where the sets are wanted, and the duty they must fulfil. Double tunnel-sets are made by placing an extra large straight set outside of the ordinary single set. Plates III and XIV show the double sets and 7-ft. square-sets erected side by side from the same floor. The principal point is that tunnel-sets of any style should always be made as nearly free and independent of the stone sets as possible; so that any settling or swinging of the latter will not affect the gangway.

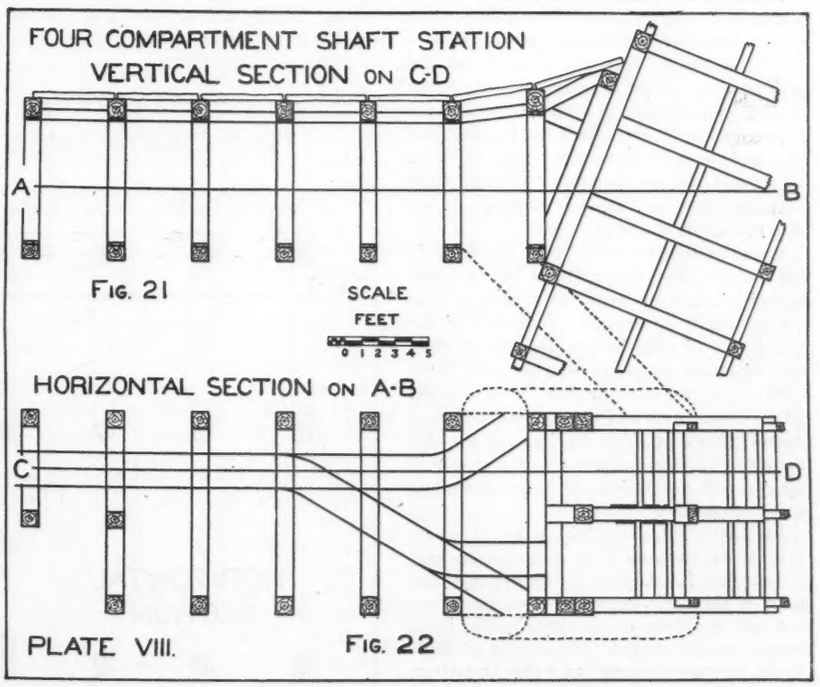
The inclined shaft-sets shown on Plates V and VI have already received comment. Where the inclination is not too great, the V tenon and mortise joint can be omitted, and then a two-compartment shaft-set becomes nothing more than a two-compartment tunnel-set, on a slope instead of horizontal. This latter method of timbering is successfully used in one 45° shaft. The limits governing its general use would be the amount of side pressure the end plates would have to carry, and also the increasing difficulty of erecting as the slope becomes greater; since there would be no V tenons and mortises to hold the end plates from dropping out while the set was being blocked and wedged.

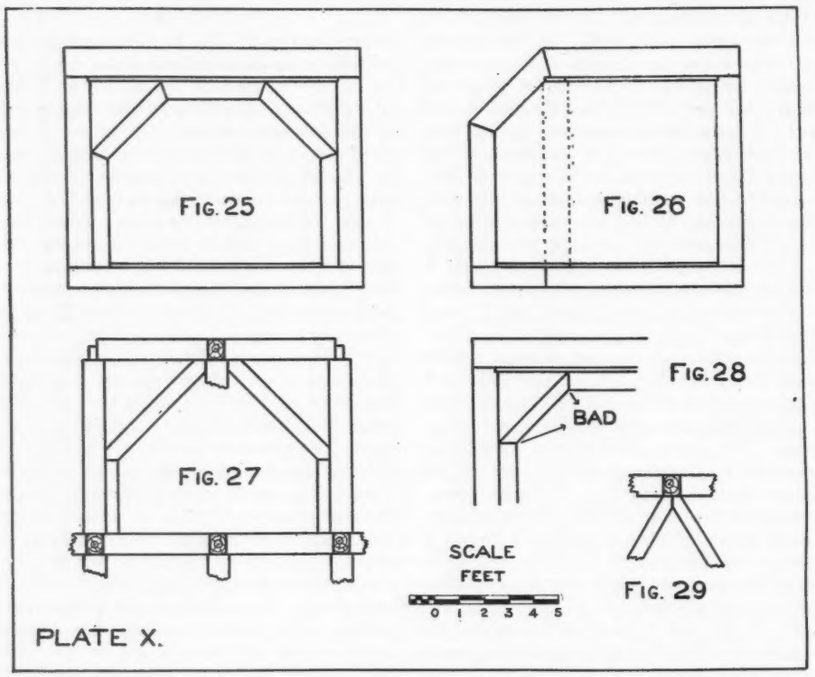
Plates VII and VIII show the general arrangement of the timbers at shaft stations on levels. The dotted lines on Plate VIII show the chutes cut in the rock, just outside the shaft covering, connecting the places where the cars are dumped at the station with the chutes in the bottom compartments of the shaft.

Plate X shows some points in detail that are quite common in use. Fig. 25 shows how segments should be framed to support a long station cap, when the load is uniformly distributed along the cap. The plane of the joints should be so cut as to bisect the angle formed by the intersection of the two adjacent segments. This practically gives them the same shape and carrying strength as an arch. Fig. 28 shows at a glance how the framing should *not* be done. The center segment would not carry any load, but would act merely as a spreader. Furthermore, the vertical side segments would carry but little weight, while the sloping side segments would thrust almost entirely outward. Fig. 27 shows the manner of holding up stope timbers so that a post can be cut off. There is no opportunity for choice as to how the top ends of the sloping segments should be framed, but at the bottom ends a method is shown which is better than in Fig. 28, though not as good as in Fig. 25. The only advantage of this method in Fig. 27 is that the vertical side segments do not have to be as large timbers as in the others. For the sake of simplicity in the drawings, it is not indicated that the posts of sets must be held against the side thrust of the segments by fillings or sprags.

Fig. 29 shows the details of the framing of two angle-braces put in from one floor up to the tie or cap of the set above, to hold a load concentrated at one point. It is similar to the method shown in Fig. 7, Plate III and in Plate XI, save that in this case the timber supported runs across the direction of the angle-braces. In these cases no sprags or cribbed fillings are necessary to hold the side posts, for the thrust is resisted by the bottom tenons. Fig. 26 shows how a tunnel may be widened, say to make room for a double track, without discarding all the timbers in place. This method, however, can not be used unless the condition of the ground is favorable, for there is the weakness of two joints on that side, instead of one. In good ground, the short side post may even be safely dispensed with, and a hitch can be cut in the footwall for the bottom end of the sloping segment.

Slight mention has been made of stull timbering. It is a large and important part of the work, though there are but few details that seem to lend themselves to description. Nevertheless, it calls for as much, if not greater, skill and judgment on the part of the timber-man to point his stulls and balance the ground to the best advantage, as in any other work. A few features are shown in Plate IX. It is always preferable to build the chutes on the foot, not only to get all the steepness of grade possible, but also because it is more convenient for loading cars when





the level is run on a bench cut in the footwall. It is desirable to run a level thus, in order that it may be left intact when the next stope from below comes through the ore left in the bottom. Sometimes, when the stope is not too high and the slope is sufficiently steep, no cribbed chute is built at all. In this case the broken rock runs down over the footwall in a passage kept open between two rows of stulls, lagged and filled on the outside. Fig. 24, Plate IX, shows a cribbed manway built up into the stope alongside of the ore-chute.

Before closing these notes on timbering in the Bunker Hill and Sullivan mines, some figures of costs in regard to square-set timbering will be of interest. Exclusive of the initial cost of material and freight, the total cost of square-set posts, caps and ties, delivered at the mouth of the mine, is as follows: Posts, 12.5c.; caps and ties, 10c. each. These figures include not only the framing, but also the cost of unloading timber from the cars at the saw-mill, the cutting and squaring, and delivery at the mine.

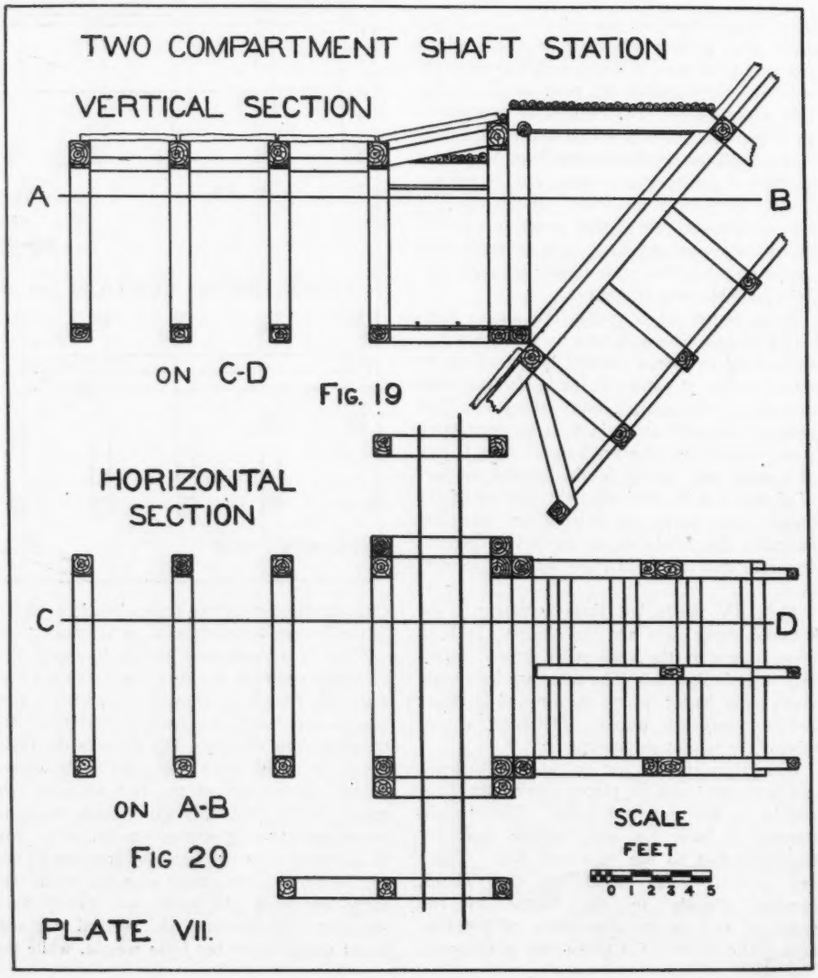
The center dimensions of a standard set are 7 ft. 10 in. by 5 by 5 ft., giving a contents of 195.75 cu. ft. Assume, for an example, that a set is being put up in ore carrying 20 per cent galena (about 17.3 per cent lead) with a heavy quartzite gangue. The specific gravities would be approximately as follows: Galena, 7.5; gangue, 3.3; and under these conditions it would take about 8.61 cu. ft. of ore in place (unbroken) to make a ton. This would give 22.74 tons for the contents of one square-set. There are parts of 12 timbers in each set—four posts, four caps and four ties (see Plate II), but only one-fourth of each of these can be charged to a single set. This would be equivalent to one post, one cap and one tie, at a total cost, for outside handling and framing, of 32.5c. per set, or 1.429c. per ton.

Especial attention is called to the fact that all of the accompanying plates are made from timbers actually in place. For convenience in getting various features in reasonable space, Plates III, IX, XII and XIII are composites.

In concluding, I wish to express my thanks to Mr. Stanly A. Easton, manager, and to Mr. T. H. Simmonds, superintendent, of the Bunker Hill & Sullivan Mining & Concentrating Company for the assistance they gave me in gathering information.

CEMENT RESOURCES OF ALABAMA.

A recent paper by Eugene A. Smith, which is to be published in a bulletin issued by the United States Geological Survey, calls attention to the resources of Alabama in raw materials for cement manufacture. So far the State has only one producer of portland cement, although limestones and clays of suitable quantity are found over a wide area. In northern Alabama the Paleozoic formations include extensive outcrops of shales, limestones and clays, which have been analyzed and found to be adapted for cement manufacture. In central and southern Alabama the raw materials are argillaceous limestones, purer limestones and clays. The limestones that are suitable for use as cement materials occur mainly at two horizons—the Selma chalk, or rotten limestone of the Cretaceous, and the St. Stephens formation of the Tertiary. The clays available are residual clays derived from the decomposition of these two limestone formations, the stratified clays of the Grand Gulf formation, and the alluvial clays that are found in the river and creek bottoms. Inasmuch as material that is well adapted to the manufacture of cement can be had in practically unlimited quantity, the selection of sites for manufacturing plants will be determined by other considerations than the quality of rock. Chief among these will be facilities for transportation, cheapness of fuel and the price of labor. Mr. Smith enumerates available sites and discusses their respective merits, adding analyses of numerous Cretaceous and Tertiary limestones, clays and cements.



HOT SPRINGS AND THE SIMPLON TUNNEL.*

In November, 1901, the air delivered at the heading had a temperature of 75° F., and the atmospheric temperature during boring was 79°, and during mining 84° F. In February, 1902, these temperatures had dropped to 59°, 72° and 81° F. respectively, while the infiltration water and rock temperature were continuously rising—the water then at 113° and the rock at 109°. It should be here noted that the heat of the water has always been greater than that of the rock, the theory being that the liquid heats the mineral. This is readily confirmed in the surface-cooled walls of the tunnel by placing the fingers in a leak from one of the closed-in hot springs where the heat of the water, just bearable by the hand, is found to be diffused, with scarcely any appreciable loss of temperature, through a large surface of contiguous rock. The water is supposed to emanate from some subterranean lake, probably a very warm one, or otherwise from wells in a common cellular formation of mountains, and these, according to the theory of neighboring stratifications, would be fed from water syphoned from the Lake of Avino, some 2.5 km. or more to the south of this part of the tunnel line. Nothing certain, however, is known as to this derivation, for the theories of the official geological experts have been so rarely correct—as might be supposed at such a depth below the surface—that the working engineers have found it best always to avoid any deductions based upon them. The temperatures of hot water and of rock noted are always taken, the first in the springs themselves, and the second in bore-holes. At the end of May, 1902, the water tended continuously to increase in temperature above that of the rock, and it then attained 124°F., while the latter had only increased to 117°. The temperature of the air discharged into the heading had then decreased to 66°. From that time onwards to February, 1903, the maximum temperatures of the rock in the Simplon tunnel were encountered, rising up to from 128° to 130°, but the temperature of the water remained at very little above that—from ½ to 2°, and in general the variations noted since then did not usually exceed 2 to 3° above, excepting in September, 1903, when the maximum variation attained was 5°—rock 118°, water 123°. The important fact to note is that while the rock temperature in February, 1903, was 125°—at advance point 8.7 km.—and had since that time, up to May, 1904, steadily descended to 112°, both for rock and for water, the temperature of the air discharged into the heading, on the contrary, rose throughout that same period until it had reached, from a minimum of 62°, in February, 1903, to 80.6° in May, 1904, while the general atmospheric temperature during boring was 84°, and 92° during mining. These high temperatures had never before been attained, excepting momentarily, whereas, in May, 1904, the rise was constant, and tended still further upward, despite the continuous fall in temperature of rock and of water, as already noted.

At that time—May, 1904—the working conditions had become more and more intolerable, and the exhaustion of the miners was very rapid. Only the most vigorous men could be employed, and then only by means of short shifts and especial care for the health and strength of the operatives. It would be difficult to convey a full idea of the onerous and exhausting conditions of work under which the men finally labored. There were no deaths—thanks to the especial care taken for the men—but with the further continuation of the boring this would have been scarcely avoidable. At the period mentioned the engineers were, however, undaunted and confident of being able to pull through to the end. Aided by the encounter with a softer rock, the result of their exertions and the system of short shifts adopted is visible from the figures of the daily progress made in the last days of the work, from which we quote: 2.20m., 4.00m., 3.50m., and even 5m.; the total of the last ten days being 32.80m., or nearly 11 ft. per day, made under the most adverse circumstances possible.

*Abstracted from *The Engineer*, September 9, 1904.

DETERMINATION OF ASH IN COAL.

While one kind of coal is not necessarily of less heating power than another because it contains more ash, the ash content is the readiest basis for comparing consignments of the same or of similar coal. The fusibility of the ash is also of high importance, and this fusibility, as Mr. John W. Cobb recently points out in the *Journal* of the Society of Chemical Industry, is rarely determined at present. If the mineral constituents clinker, the air supply through the furnace-bars is checked, causing a loss of heat and a further loss in removing the clinker. Moreover, the completeness of the combustion depends largely upon the absence of fusion in the ash. This may affect the laboratory analysis, for if the ash is heated too high the fusing ash will enclose unburnt carbon. The determination of the quantity of ash is simple, yet errors are common; draughts must not be allowed to play on the crucible, as they carry away particles of ash, and an oxidizing atmosphere should be maintained in the muffle. In his analysis Mr. Cobb follows the general practice. The silica is separated, as usual, and the filtrate precipitated with ammonia and ammonium sulphide; the aluminum, iron, manganese, titanium and phosphorus thus precipitated are re-dissolved in hydrochloric acid, and once more precipitated by the same agents. Lime is determined by ammonium oxalate, the sediment being re-dissolved in sulphuric acid and titrated with permanganate. The phosphorus determination Mr. Cobb uses, though not quite exact, answers for practical purposes with small quantities of phosphorus, and is rapid. The filtrate from the silica is treated with ammonia, the precipitate re-dissolved in nitric acid, precipitated with ammonium molybdate, filtered through asbestos, and the molybdate precipitate dissolved in standard soda, which is titrated against standard sulphuric acid, phenolphthalein serving as indicator. As the composition of an ash will not show if it is fusible, the fusibility is estimated with the aid of Seger cones. The ashes are finely ground, and shaped into pyramids 3 in. high, with bases 1 in. square; dextrin is added if necessary. The pyramids are dried, set in a laboratory furnace, and the temperature is slowly raised until one of the pyramids begins to bend over; the pyramids are then examined. If absolute temperature determinations are desired, a thermo-couple is used. The heating should be slow. The unburnt carbon in the ash can be estimated by ignition. after grinding the ash very finely. The loss in weight will mostly be due to the burnt carbon, but may also be due to the escape of sulphur compounds. When moist air is passed through ashes which are heated in a combustion-tube, the evolution of volatile sulphur compounds may go on for 24 hours; a portion of the sulphur is retained in the clinker. If oxidizable compounds should be in the ashes, the weight will increase on ignition.

COAL MINING AT COLEMAN, ALBERTA.

In the September number of the *British Columbia Mining Record* E. Jacobs gives a description of the work under way for the International Coal & Coke Company, at Coleman, Alberta. The company's lands are four or five miles west of Blairmore, extending about seven miles north and south on the strike of the coal measures, which dip west, and being about a mile wide. Most of the land is south of the railway, which follows the course of the Crow's Nest river, the railway passing within 200 yd. of the main entry to the mine now being opened. There are said to be nine seams of coal on the company's lands, only five of which have been prospected. No. 1 is about 5 ft. thick; No. 2, 14 ft.; No. 3, 17 ft.; No. 4, 11 ft., and No. 5, about 7 ft. A main entry 10 by 14 ft. has been driven about 2,000 ft. on No. 2 seam, and at about 1,000 ft. in a rock tunnel has been driven 790 ft. east to cut a lower seam. The mine is being opened on the room-and-pillar system, and will be ventilated by a 16-ft. Capell fan. Compressed air will be used for haulage. Over 500 ft. of entries have already been driven on the seams. The coal is pronounced an excellent steam fuel. The present output is about 150 tons a day, all of which is taken by the Canadian Pacific railway. When mining begins in earnest the output will be 400 tons. No. 2 seam is stated to show 12 to 14 ft. of clean coal, assaying 60 per cent fixed carbon, 30 per cent volatile combustible matter and 10 per cent ash. No. 5 seam, which makes a firm coke, shows 64 to 70 per cent fixed carbon, 25 per cent volatile matter and practically no sulphur.

The tipple, beside the Crow's Nest railway, has a chain car-haul, also bins of a present capacity of 1,000 tons. Shaking screens and an improved picking belt are used to clean the coal. Construction work on the power plant is well advanced. About 50 of the first battery of 104 coke ovens have been fired, and the remainder are nearly completed. The number of ovens will probably be increased to 400 later. Altogether there are now about 250 men employed. H. N. Galer is vice-president and general manager, and E. C. Reynolds, a former Pennsylvania mine inspector, is general superintendent at Coleman. This town, established by the company, has a flourishing appearance. There are two other towns—Frank and Blairmore—near the coal mines of the Blairmore-Frank district.

The world produced 13,769,201 short tons of salt in 1902, of which the United States contributed 24.3 per cent; Great Britain, 15.4 per cent; Germany, 12.7 per cent, and India, 8.5 per cent; the balance of 39.1 per cent was credited to numerous other countries.

The two chief coal producing centers in the Transvaal are Springs and Middleburg. There are eight producing mines in the Springs district, which has been the center of coal production, while there are now in the Middleburg district 17 mines sinking, under development or producing. These 17 mines employ 230 white men and 1,500 Kaffirs.

THE DECANTATION PROCESS OF SLIME TREATMENT.*

By E. J. LASCHINGER.

The usual process of slime treatment on the Rand is to conduct the mill pulp from which the leachable product has been separated into a settling vat, the stream being diverted into a similar vat when the first is sufficiently filled. The sludge from which the surplus water has been drawn off is transferred with weak cyanide solution to a treatment vat, the ratio of solution to dry slimes being about 3.5:1. Agitation of the solution and slimes during the transfer is an essential feature. To ensure thorough solution of the gold a second transfer is sometimes practiced, or additional circulation carried out during transfer. The mixture is then allowed to settle, and the solution (called the first wash solution) is decanted off. The sludge is next transferred with cyanide solution, ratio 3.5:1, to a second treatment vat, allowed to settle and again decanted. This is called the second wash. Finally the sludge is discharged, with sufficient water to make it flow to the slime residue dam. The second wash is made up of solution which has gone through the zinc-boxes, while the first wash is made up of second wash gold-bearing solution and sufficient strong solution to bring it to the required strength in cyanide. The first wash is decanted off to filter vats, whence it goes to the zinc boxes.

The above process has given highly satisfactory results, so successful, indeed, that the tendency is now to produce a high percentage of slime rather than to avoid making it in the mills, the more ready solubility of the fine gold reducing the percentage thrown away undissolved in the residues. The finer grinding of the richer and more pyritic portion of the Rand ore is tending to produce slime richer than the present average of 2 to 3 dwt. per ton. It is obvious that the process may be modified by varying the number of washes and the ratio of solution to slimes. The effect of such modifications is studied in the present paper.

Good practice on the Rand shows that 92 per cent of the gold in the slimes will be dissolved before the first wash is decanted off, and no more gold in subsequent washes. The solution leaving the zinc-boxes will contain 0.07 dwt. per ton. After each settlement and decantation the sludge will contain 45 per cent moisture. The ratio of washes to dry slimes is 3.5:1.

(Assuming the above data, Mr. Laschinger has made an algebraic investigation of what the final extraction of gold should be from slimes of different grades under various modifications of treatment. It is impossible to condense satisfactorily his formulæ and tables, and therefore only the conclusions will be summarized).

PERCENTAGE OF GOLD EXTRACTION.

A. An investigation of the standard process of two washes, of which the second is used to make up the first, the second being made up with precipitated solution, and only the first wash precipitated, shows that the percentage of extraction increases as the value of the slimes increases.

A_1. By decreasing the ratio of solution to slime from 3.5:1 to 2.5:1, the extraction is diminished about 6.5 per cent.

A_2. By increasing the ratio of solution to slime from 3.5:1 to 4.5:1, the extraction is increased about 2.5 per cent.

B. The use of three washes, of which the first is made up from the second, the second from the third, and the third from precipitated solution, only the first being precipitated, will give about 4 per cent higher extraction than the two-wash method.

As in case A, the use of a smaller ratio of solution to slime diminishes the extraction, while a larger proportion increases it.

An analysis of the tables and plotting of curves shows that the point where an increase or decrease in the percentage of extraction is most effected by the ratio of solution to slimes lies between 3:1 and 3.5:1. This indicates that the best ratio for ordinary work on low-grade slime, taking into account the fact that working expenses increase with an increase in the ratio, is about 3.25:1, but to be on the safe side, should be slightly over, rather than under that proportion, or say 3.5:1. This is a confirmation that the ratio found most economical in practice on the Rand agrees with the theoretical deduction. In the treatment of rich slime it might be advisable to employ a ratio of 4.5:1, where a 1 per cent increase in extraction might warrant the extra expense in handling more solution and providing more vat capacity.

C. In cases A and B it was assumed that the slime, after settlement and decantation, contained 45 per cent moisture, which in good ordinary practice is a common ratio, though it is affected by various factors, such as depth of settled charge, time available for settlement, nature of slimes and their specific gravity. Taking the same conditions as in case A, but varying the moisture tenor of the sludge, it is apparent that the completeness with which settlement and decantation are carried out has a very important effect upon the extraction. As good an extraction is obtained by decanting off a 3.5:1 wash, so as to leave only 40 per cent moisture, as by decanting a 4.5:1 wash, leaving 45 per cent moisture.

Mathematical investigation confirms the result, found in practice, that the less gold in the precipitated solution, the better the extraction, though this may be lost sight of in the idea that the solution from the zinc-boxes is continually in circulation through the process. However, if in the treatment of 2-dwt. slime by the standard two-wash process the value of the solution leaving the zinc-boxes be brought down from 0.07 dwt. per ton to 0.04 dwt. there is a gain of over 1 per cent in the extraction.

Failure to effect complete solution of the gold before the first wash is decanted off also diminishes the extraction. Comparison of results between (1) dissolving 92 per cent of the gold in the first wash, and (2) dissolving 72 per cent in the first and 20 per cent in the second, ratio of solution to slime being 3.5:1 and moisture tenor of sludge being 45 per cent in each case, shows a falling off of 4.364 per cent in the extraction. This indicates the importance of a thorough agitation and aëration of the slimes and solution before the first wash is decanted off.

D. The two-wash method assumed in case A may be modified by precipitating the gold from two washes instead of only one. There would be, however, a gain of only about 1 per cent in the extraction, and unless the slimes were rich (say, over 10 dwt.) there would be a positive loss, due to increased costs in working and capital expenditure.

E. The three-wash method assumed in case B, modified to precipitate two washes instead of one, shows substantially the same results as in case D.

F. A three-wash process in which the gold is precipitated from the first and second, the first and third being made up with precipitated solution, and the second with third wash, shows about 4 per cent less extraction than in case A.

WORKING COSTS.

For various reasons the centrifugal pump has been generally adopted on the Rand as the standard machine for circulating and transferring sludge and solutions. Some of the reasons for adopting the centrifugal pump in preference to plunger pumps (which have a higher mechanical efficiency) are:

1. Convenience and safety; 2, efficiency in breaking up lumps of slimes, agitating and aërating the sludge; 3, no valves to give trouble and wear out; 4, cheaper first cost, less maintenance cost and greater cleanliness in the pump house; 5, large capacity and consequent saving in time to perform an operation; 6, adaptability to electric driving without noisy toothed gearing.

The cost of pumping corresponds to the formula

$$C = K H \div 9.9 E,$$

in which C = cost in pence per ton of 2,000 lb., K = cost of horse-power per hour in pence, H = static head pumped against in feet, E = percentage mechanical efficiency of the pumps and piping. From actual efficiency tests at some of the most recent plants, and assuming the cost per horse-power-hour at 1.5d., the following average power costs in the up-to-date plants of the Rand have been deduced: 0.1d. per ton for transferring sludge, 0.2d. for discharging sludge to residue dam, 0.15d. for pumping solution, 0.4d. for pumping high pressure water for sluicing out slime from vat for discharging. It may be assumed that the cost of precipitating the gold from one ton[1] of solution is 1.5d., including consumption of zinc, clean-up and smelting costs, but not labor. Assuming different ratios of solution to slimes, and the ratio of water to slimes when discharged to dump at 1.5:1, the power cost of transferring is found to range from 0.477d. per ton of dry slime, at ratio 2:1, to 0.852d. at 3.5:1, and 1.227d. at 5:1, while at the same ratios the cost of precipitating gold is 1.773d., 4.023d. and 6.273d., respectively; the power cost of discharging is 1.072d. at ratio 2:1, and 1.972d. at ratio 3.5:1.

A fair average, under present conditions, for total working costs (including maintenance) is 30d. per ton of slime treated by the standard process, of which pumping and precipitation come to 6.5d., leaving 23.5d. as a constant sum to be added to the pumping and precipitation cost, when using other ratios of solution and slime or precipitating more than one wash. This is, of course, not strictly correct, but is very nearly so.

The capital invested in plant may be assumed to vary as the vat capacity installed, but the vat capacity installed is controlled to some extent by the size of the plant. This is because the number of collecting vats is not proportional to the number of stamps. All the vats are usually made of a standard size; there must be a sufficient number of collectors, so that one is always available when another has received its charge. A 100-stamp slime plant requires two collectors, whereas a 200-stamp plant requires only three. The number of

*Abstract of a paper in *Journal* of the Chemical, Metallurgical and Mining Society of South Africa, April 1904.

[1] A ton means 2,000 lb. throughout this article.

treatment vats varies directly as the quantity of pulp to be treated. For a 200-stamp plant, with treatment capacity for about 8,000 tons of slime per month, about 1,050 cu. ft. of vat capacity per ton of slime treated per day is required; for a 100-stamp plant, about 1,250 cu. ft. This is, for the standard two-wash process, ratio of solution to slime, 3.5:1. If three washes are to be given, the vat capacity would have to be increased about 27 per cent. If the ratio of solution to slimes be varied, the vat capacity must also be varied.

If the capital expenditure for a plant of 4,000 tons per month capacity by the two-wash, 3.5:1, method be taken as 100, and the interest and depreciation reduced to pence per ton treated be 12.35, the corresponding figures for ratio 2.5:1 would be 85 and 10.50; for 5:1, 122 and 15.07. For three-washes at ratio of 3.5:1, 127 and 15.68; at ratio 2.5:1, 107 and 13.21; at ratio 5:1, 157 and 19.39. For a plant of 8,000 tons per month capacity, by the two-wash method at ratio 3.5:1, interest and depreciation would come to 10.08d. per ton; at ratio 2.5:1, 8.57d.; at ratio 5:1, 12.30d. For three washes at ratio 3.5:1, 12.80d.; at ratio 2.5:1, 10.78d.; and at ratio 5:1, 15.82d. Interest is assumed at 4 per cent and depreciation at 9 per cent per annum. The cost of a modern slime plant of 8,000 tons per month capacity is about £31,000.

PROFIT IN TREATMENT.

Assuming that a slimes assaying 2 dwt. be presented for treatment, the profit under various conditions should be as follows:

(1) Standard method, two washes of ratio 3.5:1, first only precipitated:

Extraction @ 83.2%	83.20d.	per ton.
Working costs	30.00	" "
Profit	53.20	" "

(2) Same as 1, but both washes precipitated.

Extraction @ 84.26%	84.26d.	per ton.
Working costs	34.02	" "
Profit	50.24	" "

(3) Two washes of ratio 2.5:1, first only precipitated:

Extraction @ 76.89%	76.89d.	per ton.
Working costs	28.00	" "
Profit	48.89	" "

(4) Two washes of ratio 4.5:1, first only precipitated:

Extraction @ 85.67%	85.67d.	per ton.
Working costs	32.00	" "
Profit	53.67	" "
Extra interest and depreciation	1.51	" "
	52.16	

(5) Three washes of ratio 3.5:1, first only precipitated:

Extraction @ 87.36%	87.36d.	per ton.
Working costs	30.85	" "
Profit	56.51	" "
Extra interest and depreciation	2.72	" "
	53.79	

Hence there is no great practical gain by giving three washes rather than two.

If rich slime is treated separately, the method giving the best practical results is three washes of ratio 3.5:1, the first only being precipitated. In this way an extraction of 89.70 per cent should be made from 12-dwt. slime, or a value of 538.20d. per ton, at a cost of 30.85d. The standard two-wash method, ratio 3.5:1, has previously been shown to give a profit of 53.2d. per ton from 2 dwt. slime. If the proportion of ordinary slime to rich slimes were 3:1, and the two kinds were treated separately by the best methods, the average profit per ton would be 13s. 10.08d. If they were mixed and treated by the standard two-wash method the profit would be 13s. 4.51d. per ton; by the three-wash method it would be 13s. 10.48d. per ton. Obviously it would be better to mix the rich and ordinary slimes before treatment than to deal with them as separate products. The advantage of the three-wash method over the two-wash for rich slimes is evident.

SUMMARY AND CONCLUSIONS.

1. For the treatment of low-grade slimes the process at present in vogue on the Rand is very satisfactory, an extract of over 90 per cent of the soluble gold in a 2-dwt. slime being possible. Working costs easily may be reduced to below 2 shillings per ton treated in a large plant, while interest (4 per cent) and depreciation (9 per cent) may be less than 1 shilling per ton.

2. The best economic ratio for the washes is about 3.5:1.

3. More than two washes shows no gain from slimes containing only 2-dwt. gold per ton.

4. For slime containing 4 dwt. gold per ton, or more, the three-wash method is probably the best.

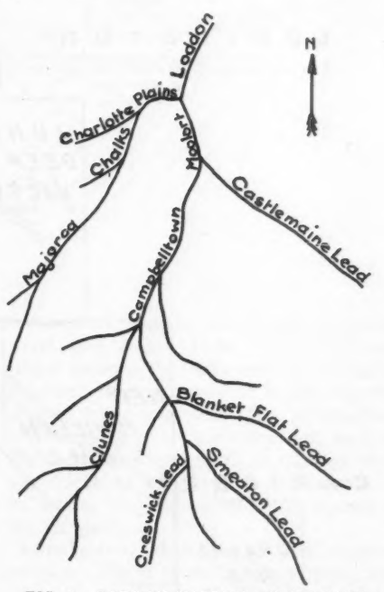


FIG. 1. LODDON VALLEY DEEP LEADS.

5. An extraction of 98.3 per cent of the soluble gold in a 20-dwt. slime is possible when employing three washes of 3.5:1 and precipitating the first two. This high extraction is comparable with that of the best filter-press work and is obtained much more cheaply.

6. It is highly important to effect a thorough settlement of the slimes.

7. It is essential to dissolve as much as possible of the gold before the first settlement.

8. The precipitation of gold from more than one wash is uneconomical except for slime containing 12 dwt. of gold per ton or more.

9. Rich, pyritic slime is better treated in admixture with ordinary slimes than separately.

10. The finer grinding of the coarser and pyritic particles should prove advantageous, but to what degree the re-grinding should be carried is still undetermined.

11. A large, well-designed plant for slime treatment by the standard process may make a small profit from 1-dwt. slimes on the Rand. Below that limit, only the indirect advantages of the plant can justify its existence.

DEEP ALLUVIAL MINING IN VICTORIA

By F. Danvers Power.

The Victorian central group of deep leads passes from south to north from Ballarat to the Murray River flats. From Ballarat to Bunninyong, a distance of about eight miles following the sinuosities of the Manuel, an average of about $5,000,000 per mile has been won. At the south end there are three main heads. The eastern branch comprises the Eganstown and Smeaton workings. The central branch includes the Creswick, Berry, Kingstown and Allendale; while in the western branch we find the Ballarat, Midas, Ascot and, as a tributary, the Clunes. Near the junction of these three heads is the Campbelltown, and on the main lead the Moolort and Loddon. On a lower easterly branch are the Castlemaine mines, and on the lower westerly branch the Carisbrook workings, including the Chalks and Majorca.

The accompanying plan shows the Loddon valley deep leads, which are covered with basalt. At the upper end, two main branches have been proved, that on the west being known as the Majorca-Chalks lead, which for a distance of about six miles from its source has yielded $12,500,000, while that on the east, known as the Berry or Moolort lead, for a distance of about six miles, has yielded $27,500,000. These results have encouraged some Anglo-Victorian companies to test and work the unproved ground. These companies include:

The Loddon Valley Gold Fields, Ltd., registered November 4, 1900. Capital, £750,000; purchase consideration, £700,000.

The Moolort Gold Fields, Ltd., registered December 1, 1900. Capital, £750,000; purchase consideration, £700,000.

These were two of the late Whitaker Wright's flotations. The vendors of these properties were the shareholders of the Victorian Gold Estate, Ltd., which was registered July 25, 1898, with a capital of £350,000.

The Victorian Deep Leads, Ltd., registered February 9, 1890. Capital, £35,000.

The Junction Deep Leads of Victoria, Ltd., registered May 27, 1898. Capital, £160,000.

The New Havillah Gold Mining Company, Ltd., registered June 2, 1898. Capital, £75,000.

The Charlotte Plains Proprietary Gold Mines, Ltd., registered September 13, 1895. Capital, £150,000.

The last two were consolidated under the name of the Charlotte Plains Consolidated Gold Mines, Ltd., on January 1, 1902, with a capital of £260,000. The Deep Leads Electric Transmission Company, registered on October 11, 1898, with a capital of £50,000, was formed with the object of providing electric power for the Charlotte Plains Proprietary, Junction Deep Leads, New Havillah and Victorian Deep Leads.

The Loddon Valley Gold Fields, Moolort Gold Fields and the Victorian Deep Leads mines are now under the control of Bewick, Moreing & Company. Mr. Drysdale Brown, of Melbourne, is chairman of the local board of advice for the other mines mentioned, and I have to thank him for much of the information concerning the mines he is connected with.

These leads have been extensively bored by the Mines Department and by private enterprise. Both diamond drills and hand-boring have been used. On a large plain, with no surface indications of what is to be found below, a large percentage of these bores have of

necessity bottomed on 'reef,' as the bed-rock is called to distinguish it from 'wash' or alluvial. These bore-holes are three inches in diameter to begin with and finish up with a diameter of two or one and a half inches, the cost ranging from $2 to $3.50 per foot. In the Chiltern district, where there is no basalt to pass through, but only sand, clay, drift and cement, the boring costs but 40 to 75 cents. The distance between the different lines of bores is so great that there is ample room for the leads to deviate from the courses assumed on the plan, but as the Victorian government recognizes the heavy outlay required to test and work such deposits, companies are allowed to hold large areas, which will permit ample margin. The New South Wales government, being afraid of the labor party, will not grant such large areas of deep-lying auriferous and stanniferous ground, consequently they remain practically untouched.

The surface geology consists mostly of basalt, through which project Silurian rocks; while to the east of the modern Loddon river are to be seen outcrops of granite. The underground geology, as shown by bores and workings, consists of a bed-rock of Silurian slates and sandstones, pipe clay and sometimes boulder clays. The lead, which has generally been considered as having been formed during the Pliocene period, but which will probably prove to be older, appears to be 700 to 1,200 ft. wide.

Until the ground is drained the hydraulic grade remains steeper than that of the wash. Roughly speaking, the hydraulic grade in the lead is 18 ft. to the mile; this varies with the nature of the drift, being steeper where the ground is tight, and flatter where the water can flow more readily through loose ground. There is a difference of about 50 ft. in bed-rock level between Chalks No. 3 and where the Charlotte Plains Consolidated is being worked, but as the head of water in the down-stream property is at present 150 ft., the higher leases are actually draining the lower. To give an idea of the rate at which the water is being reduced, in May, 1902, the water-level was 132 ft. from the surface, and the water extended over a width of 24,000 ft. In June, 1903, the water was 173 ft. from the surface and the width of water-charged strata narrowed down to 9,600 ft. The pressure has also been considerably reduced, from 68 lb. to 39 lb., at the New Havillah, and 74 lb. to 45 lb. at the Charlotte Plains Consolidated. When the pressure is reduced to 14 or 15 lb. per sq. in. opening-out work will be started. The Charlotte Plains Pioneer (now the Charlotte Plains Consolidated) lost their shaft by not tapping the water before opening out. Besides losing time and money by neglecting this necessary precaution, loss of life is also likely to occur.

There are two main systems for opening up deep leads in Victoria. The older method, known as the 'down country,' is employed in the Ballarat district; the newer method, introduced by Mr. John Cock in the northern district, is used about Chiltern and Rutherglen. In either case the ground should be properly tested by lines of bore-holes; the neglect of this has caused the loss of thousands of pounds in unprofitable driving, owing to the bad placing of shafts, or the loss of shafts which have caved in when sunk in rotten country. There are also two methods of extracting the wash, one called 'panelling,' the other 'blocking.' A typical example of the 'down-country' system is to sink a shaft in solid rock, a safe distance from the alluvial, to about 40 ft. below what is supposed to be the deepest point of the lead in that particular place. If the shaft is not sunk deep enough and the level cuts into wash, the rush of water, sand, etc., necessitates the abandonment of the shaft, as it is cheaper to sink another than to attempt to continue work in the old one. The shafts are placed about a mile apart. There are three levels—the 'bottom,' 'intermediate' and the 'wash' levels. From the bottom of the shaft a level is put in toward the lead; when it gets near the lead, the level bifurcates up and down in the direction of the supposed course. The main bottom level is made a good size; sometimes it is made unnecessarily big, with the object of storing water, so as to give men a chance of escaping in case of an outburst; but this is really of little use when a sudden rush of water takes place. A 'balance shaft' is made by raising, generally from the down-stream branch, the top of which should not be so high as the bottom of the lead, otherwise level will be lost when the intermediate is put in, which may break unexpectedly into the wash. If the intermediate level passes under the deepest part of the wash, as it should, then bore-holes are made to tap the gutter, after which raises are put up and 'wash drives' extended in the gravel. The intermediate levels are driven in the 'reef' as near as possible under the middle

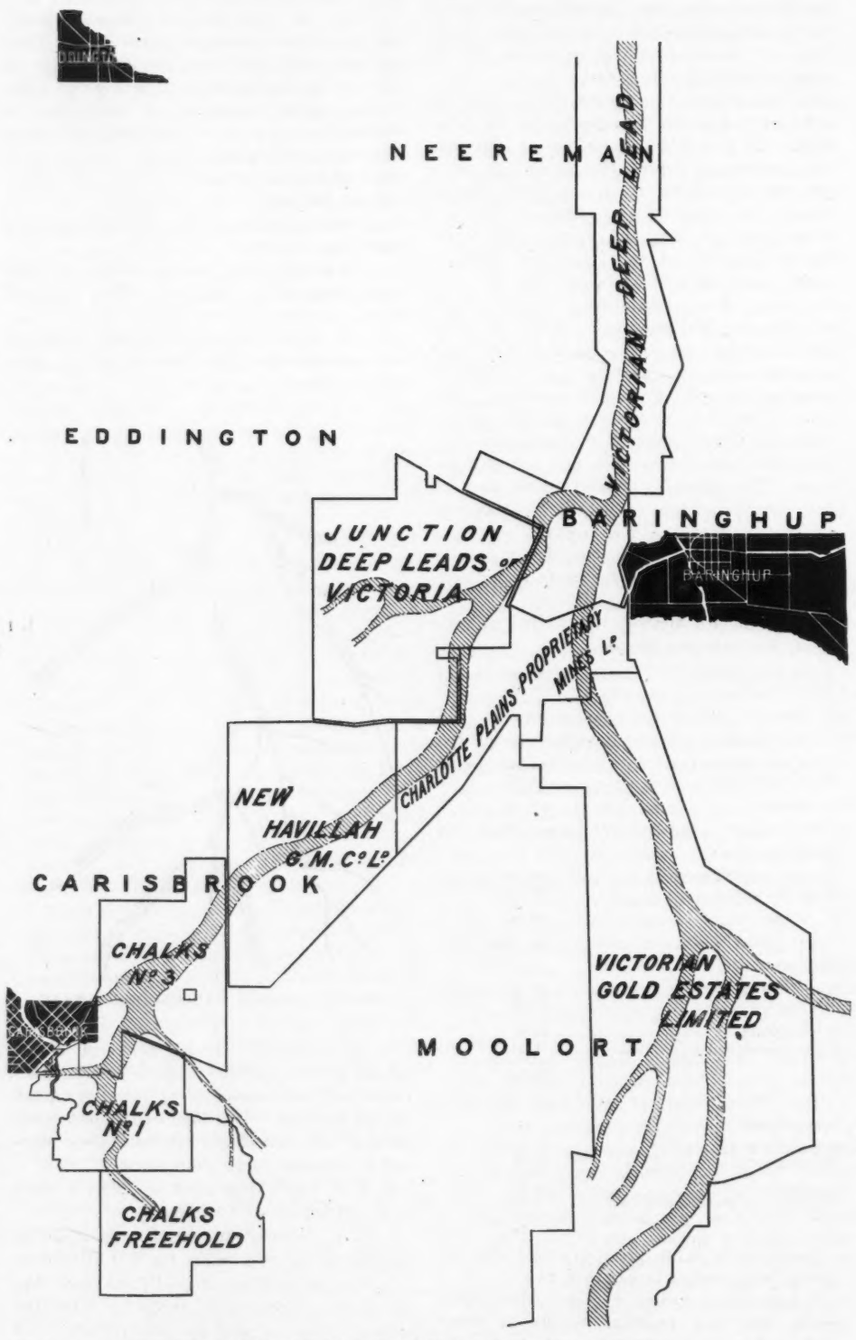


FIG. 52. BERRY-LODDON-MOOLORT DEEP LEAD SYSTEM.

of the wash, and every now and again 'cross-drives' are thrown out on either side. The intermediate levels are about 6 ft. high, with 5 ft. 6 in. cap pieces, and 7 ft. 6 in. wide at the bottom. 'Wash drives' are 5 to 6 ft. high, and as the grade is irregular, on account of the irregular bed-rock, tramming is difficult.

The balance shaft is generally divided into three compartments, one being used as a ladder way, the other two for lowering the wash dirt and raising the timber, the heavier load pulling up the lighter, the speed being regulated by a band break. A ⅝-in. close-link chain is used instead of a rope. A three-compartment balance-shaft is about 3 ft. 6 in. by 9 ft. 6 in. Timber is hauled up by hand-windlass, or partly by the weight of loaded trucks. Sometimes only one cage is employed, a weight being used to counterbalance it and the truck. From the top of this balance-shaft a branch level is advanced under the lead, from which an intermediate level is driven in the direction of the course of the lead, and as a section of the lead gets drained raises are put up to the wash, 200 to 400 ft. apart, and 'wash drives' are extended. Sometimes, instead of a balance-shaft, the intermediate level is connected with the main level, shown by dotted lines in Fig. 4. When balance-shafts are constructed, miners are liable to be trapped and drowned should there be an outburst of water, which makes this a most dangerous system of opening out. The main bottom level is given a grade of 4 in. per 100 ft., but as men are apt to lose level if not watched, the grade is often steeper, and it sometimes happens that the entrance of the 'drive' is closed by water, thus imprisoning the miners, in spite of the fact that water locks are provided, which generally jam when required in a sudden emergency. A better plan is to make the main bottom 'drive' a dead level up to where it branches. When the intermediate level is connected with the main shaft, the danger of being imprisoned by water is almost eliminated, and a good deal of bad language, which accompanies the haulage of heavy timbers up the balance-shaft, is also saved. The bottom level is driven in the assumed direction of the lead, and proceeds ahead of the upper works, bores being occasionally put up to drain and prospect the country overhead. Not knowing exactly where the lead is, a good deal of unnecessary driving is often carried out blindly, and branch levels have to be driven, from which bore-holes can be put up to prospect for the gutter. These bottom levels are frequently made with a single track, but sometimes with a double one, 161-lb. rails per yard are spiked to planks resting on 10-in.

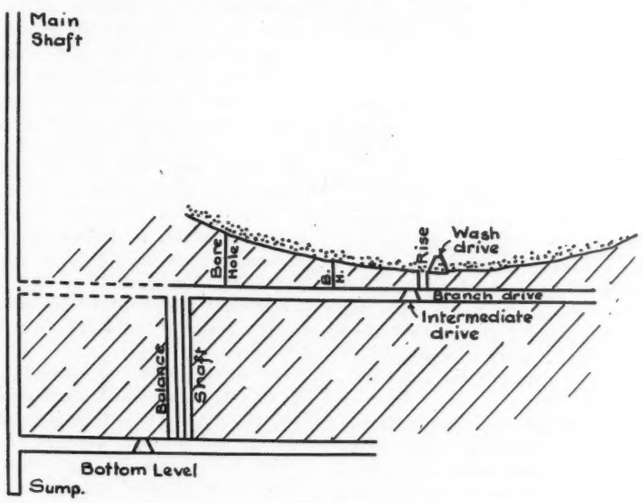


FIG. 4.

sleepers, and plenty of space is left underneath to act as a drain. These bottom levels are used to prospect the lead overhead, as a drain, and when the lead gets near it they are used to gain level, instead of the intermediate. Three-inch bores are sometimes put up from the intermediate level, in which case any water tapped finds its way down the balance-shaft to the bottom level and makes things uncomfortable all round.

Bore-holes should be put up from chambers cut in the side of levels for the purpose; they are then out of the way of the traffic, and in case of an outburst of sludge, a sand-lock provided at the entrance of the chamber will keep it back; the doors may be further reinforced, if necessary, by toms reaching from them to the further side of the level. In cases where bore-holes have been put up in the back of the level and sludge has come through, it has necessitated the closing of that part of the mine and the loss of many feet of levels. The bore-holes are jumped up with drills, by means of a lever resting in a frame near the bore-hole, or when the ground is soft, an auger is turned by two men, while a third holds the tool up against the rock with a lever. Bores from the Moorlort and Loddon Valley mine workings have yielded gold at the rate of $4 to $80 per ton, but will probably average about $15 per square fathom.

IDEALS AND STANDARDS OF STATE MINERAL EXHIBITS.

By F. J. H. Merrill.

With the exposition habit deeply rooted in our nation, the preparation of exhibits illustrating the mineral resources of States and Territories has become an accepted function of geologic surveys and allied State institutions. Geologists of national reputation are called at public expense to examine these exhibits and give awards to such as are found deserving of recognition. The commissioners appointed or elected in the several commonwealths consequently expect the persons in the State employ who have had experience in the study of its mineral resources to be capable of assembling and installing, in a creditable manner, collections illustrative of its natural mineral wealth. Furthermore, the citizens, looking to the commissioners as their representatives, expect that a fair proportion of awards of respectable rank shall be given to the exhibits prepared with public funds. It devolves, therefore, upon the individuals to whom is assigned the duty of superintending such exhibits to use the funds allotted in such a manner as to attract the favorable opinion of the jurors.

In many cases the allowance is inadequate to permit competition with other States where more interest in a mineral exhibit exists. Sometimes it is easier for a commission to obtain funds for dispensing entertainment to an admiring constituency than for paying the difference in cost between a commonplace exhibit and one which would be brilliant.

The director of a State exhibit who has had experience with more than one exposition will realize that different jurors are interested in different things, that the standards of one exposition are not necessarily those of the next one, and he will endeavor to meet the demands of many different minds. It often happens, however, that the duty of handling exhibits passes from one person to another, and that cumulative experience is not available. For the guidance of such persons in future expositions, the writer ventures to put on record a few observations and conclusions in regard to the treatment of mineral exhibits. Primarily, it may be said that many purposes would be served if jurors could be appointed several months before the opening of an exposition. They could then issue, in advance, a circular letter specifying the broader standards, for attention to which the higher awards would be given.

From a general review of mine exhibits in expositions past and present, the methods of treatments may be classified in three different types—scientific, artistic and spectacular. By scientific treatment is understood systematic arrangement, careful labeling and the recording of full information concerning the sources of materials, their composition and their qualities. This part of the work is often sadly neglected.

By artistic treatment is meant the careful exercise of good taste in form, color and arrangement. Too often is little heed paid to

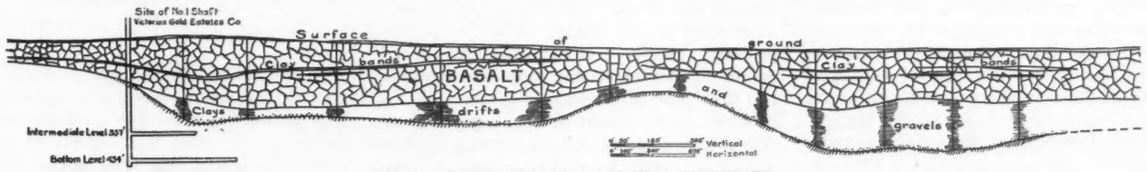


FIG. 3. CROSS SECTION ACROSS BARINCHUP.

these details. This treatment, when well developed, involves considerable expense for material and finish in installation.

The spectacular treatment is that method of display primarily employed chiefly in shop windows, where large quantities of material are massed for effect. In combination with the other two methods, the spectacular arrangement can be made very effective and instructive, but should not predominate throughout an exhibit, and should be proportioned to the amount of space occupied. An economy can often be effected by interesting corporations or individuals in contributing spectacular exhibits to illustrate their special products, while the public funds are used to secure completeness for the general exhibit and unity of general effect.

To illustrate the application of these methods of treatment, some instances may be noted in the Mines building at the St. Louis Exposition. In the artistic and decorative phase, Colorado is noticeable for her elaborate displays of minerals in cases of mahogany and plate glass and her enclosure of polished stone and onyx. For an effective combination of the scientific, artistic and spectacular, the Maryland exhibit bears witness to the genius of her State geologist.

Many States attract attention by large masses of certain minerals. Examples of these are seen in the sulphur and rock salt of Louisiana, the zinc ore of Missouri and Arkansas, the coal of Pennsylvania, Maryland, West Virginia, Kentucky, Indiana and Illinois, the copper of Michigan and Montana, the iron of Minnesota, Michigan and Alabama, the gypsum of Oklahoma, the clay products of Ohio and New Jersey, the asbestos and graphite of Canada, the lead ore of Wisconsin, and the gold and silver ores of several western States. Such materials lend themselves readily to spectacular treatment, but monotony should be carefully avoided.

The successful application of this treatment to building stones is well exemplified by Minnesota in an effective and artistic display of large masses of these materials, also, but with less variety, in the space occupied by Indiana. Spectacular exhibits of portland cement products are noticeable in the enclosures of the spaces allotted to Pennsylvania and Michigan. Examples of artistic installation are seen in the oils of Pennsylvania, displayed in thin, flat bottles of cut glass. The mineral exhibit of Japan is scientific, artistic and to a satisfactory degree spectacular. It is one of the best exhibits in the building, though its position under the gallery is somewhat defective in illumination.

After the general methods of treatment have been considered comes the matter of installation detail. Here the experience and practice of the best museums become available. Some of the principal questions to be considered are the form and material of exhibition cases, material and typography for labels, frames and supports for photographic enlargements, backgrounds for maps and illustrative charts, methods of displaying publications, the preparation of manuscript maps and charts, and the construction of relief models.

When sufficient money is available, as much material as possible should be put under glass. This protects the exhibits from the abundant dust of the exposition building, which often contains flakes of paint or whitewash from the roof trusses.

In all cases, if possible, the plate-glass sheets should be united by metal angles rather than by wooden frames. Handsome cases of this type are used in Pennsylvania for exhibits of glass sand and other materials, and also by Montana. Theoretically, the eye should be attracted only to the minerals exhibited. In table cases a wooden frame is not objectionable if well made. The Colorado cases meet this requirement very satisfactorily.

Labels should be neatly printed on cardboard or paper, tinted to prevent the unavoidable yellowing of white paper from being noticeable. Either bluish gray or buff colors are satisfactory in appearance. Antique Roman type, in caps and lower case of proper sizes, printed in black ink, give good results for all purposes. Unnecessary punctuation should be avoided, and fancy labels and signs should never be used.

Photographic enlargements may be exhibited by prints hung on walls or screens, or displayed in wing frames, or may be made into transparencies and exhibited in vertical cases, with artificial illumination arranged behind the plates. Pennsylvania has an interesting series of this sort, though the artificial light provided is unattractive because of its yellow tone.

Many States exhibit relief models geologically colored, and these are of much value, but the scale in miles should always be clearly lettered on the map. A mere statement of the ratio to the scale of nature is meaningless to the average visitor.

Important as they are, the matters already touched upon are still subordinate to the choice of mineral material. This should be selected with the utmost care and most discriminating judgment. Enough material should be used to show all the important variations in any given mineral, but, except where there seems justification for a spectacular display, the eye should not be wearied with a monotonous accumulation or mass. Special prominence should not be given to material of inferior economic value, even though striking in form or color.

Of much value, though but seldom displayed, are suites of specimens illustrating important properties of material. A specially important collection of this sort is the series of specimens exhibited by the State of New Jersey, illustrating by tests the physical properties of the clays of that State. Such displays, to be easily understood by the public, should be accompanied by descriptive labels of large size, giving an outline of the tests and properties discussed and their relation to commercial use.

While most mineral products may best be shown with surfaces of natural fracture, building stones, apart from any spectacular treatment, should be exhibited in a series of dressed cubes, showing on the several faces the different kinds of finish. Eight inches on the edge is sufficiently large to illustrate all necessary qualities, but 10-inch cubes are more effective in appearance. Stone available for decorative purposes may be shown in polished slabs or turned columns. Roofing slates and flagstones should be shown in their commercial forms.

Exhibits of mining or ore-dressing machinery in operation are of much interest, but should not be of a noisy sort, or the attention of visitors will be distracted from other important parts of the exhibit, and the examination of it will become a matter of discomfort. Dust-producing machinery should obviously be excluded. Miniature working models of coal-breakers and other large plants for treating minerals are of much value.

Decorative structures covered with mineral fragments have been installed by some exhibitors at the St. Louis Exposition, but have not excited interest on the part of jurors. The feeling seems to be that such a structure should bear a practical relation to the commercial uses of the material of which it is made.

Maps, either published or in manuscript, illustrating the distribution of mineral resources, are of much importance and should be as large as practicable. Publications on the mineral resources of a State are also of much value. Among many good collections of such material, those of New York are worthy of notice.

In planning a State exhibit the director should give his attention not only to the preparation of a good collective exhibit, but also to the development of some group exhibits which may be entitled to recognition by the jury. Where individuals or corporations have contributed special exhibits, these are entitled to separate consideration for award. Too much importance cannot be attached to the matter of having an experienced person in charge of the exhibit. If it is to serve its full purpose of efficiency, visitors desiring information on practical matters should be intelligently and courteously answered. The fact that many unintelligent questions will be asked should not be allowed to overweigh the primary consideration.

The writer makes no attempt to compare the various State exhibits or to criticise them. The purpose of this article is to classify the methods and principal features of exhibition work. The successful application of these principles will depend upon the scientific and artistic ability of the exhibit director and his ingenuity in making his allowance of money, however small, go as far as possible. To the man who is able to accomplish the best results in proportion to his means due credit should be given for executive ability, and, with this in view, jurors might well take into consideration the amounts of money spent on the various exhibits.

In conclusion, it may be said that not the least important result of exposition work is to form additions to State museums, or nuclei for their development where they do not already exist, and thus form permanent and valuable collections of economic material.

GOLD DISCOVERY IN JAPAN.—The goldfield of Iwate, recently discovered, has been declared government property and will be developed under the supervision of the State. Engineers who have visited the field report that it is the richest in Japan.

PRODUCTION OF RUSSIAN MANGANESE ORE.—According to our German contemporary *Glückauf*, the output of manganese ore in Russia during 1903 amounted to 25,266,150 poods, or 413,860 metric tons. This shows a further decline in the industry due to the continuance of the depression which began in 1901. The output is but little more than half of the total recorded in 1900 and falls considerably short of the production for the previous year, which was 28,648,635 poods. As usual, the Caucasus district contributed most of the supply, its output amounting to 22,974,603 poods. There were 251 mines under exploitation in this district, and the total number of employees was 2,004, as compared with 3,702 in 1902.

STEEL MINE TIPPLES.*

By GEORGE S. RICE.

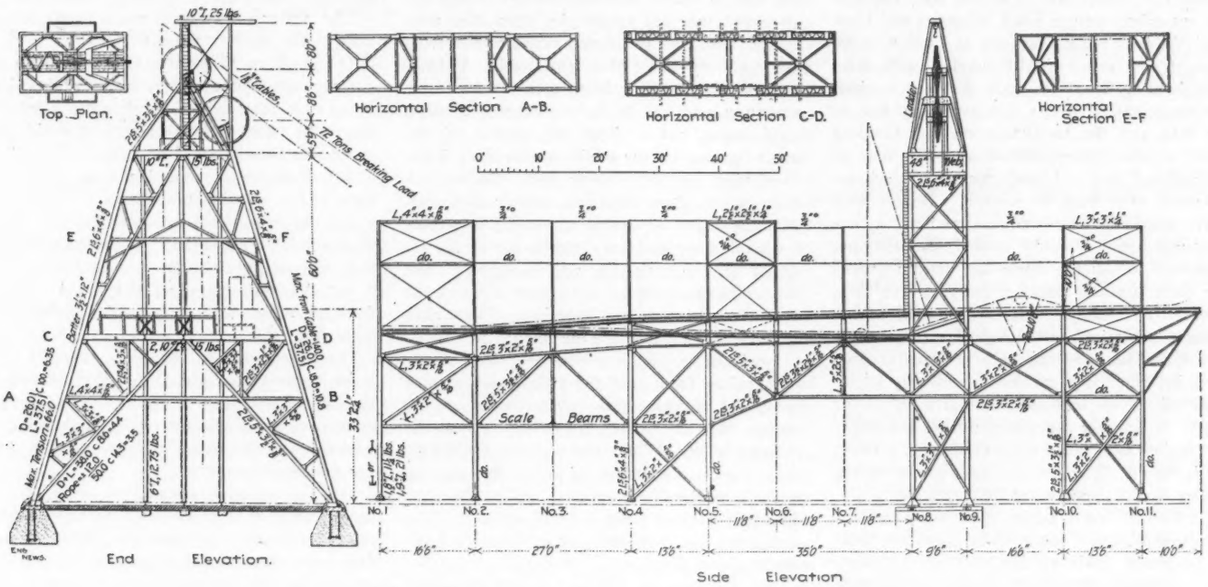
The term tipple, properly used, includes both the dumping part of the structure and the head-frame or tower immediately over the shaft and supporting the hoisting sheaves. The first steel tipple used at a coal mine west of Pennsylvania was erected by the Spring Valley Coal Company, in Illinois, some 10 years ago. About the same time a demand for better screened coal led to the introduction of shaking screens, and revolving screws are now generally discarded. The wooden frames formerly used were commonly inadequate to transfer to the foundations the strains set up by a shaking screen 30 to 50 ft. long, and making over 100 strokes per minute. Such screens may be single or double deck, but are usually divided into sections driven by pairs of eccentrics 180° apart, but the shifting load of coal makes it impossible to balance more than partially the pull and thrust. At first manufacturers of structural steel did not appreciate the effect of this lively shaking.

The wide differences in tipple design are due to differences in mining conditions. Thus, in Illinois there are the 3-ft. Wilmington vein, worked longwall, in the northern part of the State, and the 9-ft. veins, worked room-and-pillar, in the south; the roof overlying the coal may be good or bad; rock may be hoisted or gobbed; the beds may be crossed by small folds—all these factors determining the size of mine car that can be used to best advantage. Advanced practice is to make the cars as large as such conditions permit, 2.5 to 3.5 tons, the limit being the largest car that can be pulled from a room up the steepest normal grade of that mine by the largest mule that can pass through the roads. On more permanent main roadways mechanical haulage can take care of the most difficult conditions.

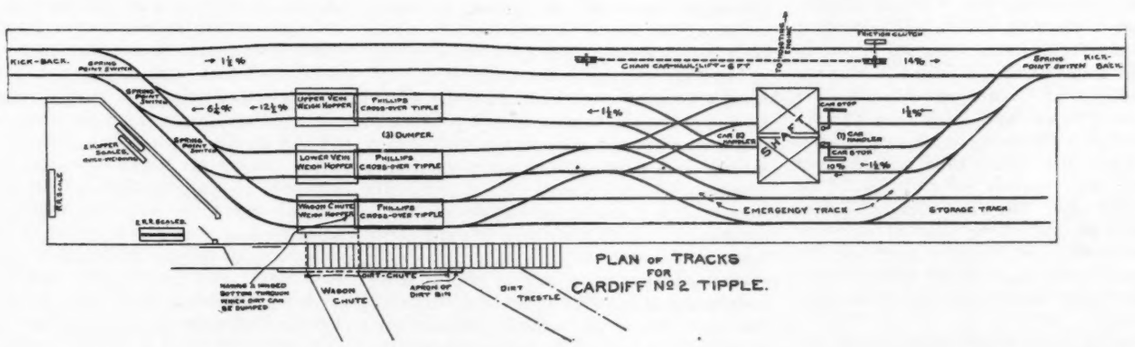
The use of self-dumping or of rigid cages divides tipples into two classes. Self-dumping cages are used at a large majority of the mines in middle and southern Illinois and also in Indiana. A subdivision of the self-dumper is the hopper cage, corresponding to the skip used in metal mining. The hopper cage necessitates two dumpings of the coal, against one where the pit car is brought to the top, hence increases the proportionate output of fine coal, and cannot be used for men. There is but one example of the hopper cage in Illinois.

Rigid cages, the older style, are used in most of the small plants, but also in some of the largest. With plenty of room on the upper landing and other conditions the same, the rigid cage permits a larger output than the self-dumper, for the latter does not always dump all the coal out of the pit car, particularly if the coal is wet, thus causing delay; also, delays above ground in shifting railroad cars or in changing the flaps of screens, or below ground, from a temporary lack of loaded pit cars at the shaft bottom, stop hoisting; and if rock refuse has to be hoisted and dumped, the cage has to dump to the opposite side or else chutes must be shifted, causing delay With the plain cage, if dumping ceases a minute or two, hoisting may continue, or, if hoisting stops, the cars on the tipple may be dumped; while hoisting a rock car causes no additional delay. These little savings in time amount to considerable in a day. The self-dumper is also more liable to disarrangement, particularly with deep hoists, and pit cars are very apt to jerk loose when the platform tips and to lodge in the chute. Still, the writer thinks that for shafts not over 300 ft. deep, with large pit cars and no refuse rock to hoist, the self-dumper is cheaper to instal and to operate, and gives as large a capacity as is desirable in any one shaft, 2,200 to 2,400 tons per day of eight hours.

The rigid cages may be classified as single deck, double deck, single deck with two cars side by side, and single deck with two cars end to end, in the order of their capacity. The first is the oldest form of cage and the most commonly used. The second—the double-deck cage—is used at only three or four coal mines in the middle West, all in northern Illinois. The third, single deck with two cars



STEEL FRAME WORK OF TIPPLE FOR CARDIFF NO. 2.



*Abstract from 'The Use of Steel for Coal Mine Tipples and a Classification of Same,' *Journal* of the Western Society of Engineers, August, 1904.

side by side, is used abroad more or less, but not in the West. It is certainly inferior to the single deck with cars end to end—now in use at one mine in northern Illinois, and being installed at another in the same district.

The arrangements for receiving and dumping pit cars hoisted and delivered at the dumping floor are various. When the tipple floor is flat, the cars are run off and on, and pushed about by hand. In improved tipples the rails of the cage are momentarily tilted by certain devices to aid the loaded car. The flat floor tipple is the prevailing type in Iowa, Missouri and Kansas. At its best, its capacity is 1,000 to 2,000 tons of coal in an eight-hour day, with mine cars holding 2,400 to 2,600 lb., and a shaft not over 300 ft. deep; this requiring five or six men and the weighman on the dumping floor, besides the weighman and the men on the railroad cars. If much rock is hoisted two or more men may be needed. Double-deck cages would be of no advantage here, as the hoisting capacity would exceed the dumping capacity. When the tipple has certain grades for the mine car tracks a car may run to a Mitchell or Phillips cross-over dump, thence down a short incline through a spring switch to a kick-back, and thence to a transfer platform by which it is carried sidewise up an incline till in line with one compartment of the shaft. A Ramsay cager then pushes the empty car against the loaded car on the cage, running the latter off. The several plants of the Spring Valley Coal Company are thus arranged.

At Cardiff No. 2 tipple, plans of which are here given, where double-deck cages are used, an automatic chain car-haul carries the empty car to a proper height for running on the cage, and with this arrangement a steam-ram is not needed. With a shaft not over 200 ft. deep, pit cars holding one ton or more, and single-deck cages carrying one car, there is no difficulty in obtaining a capacity of 1,400 tons in eight hours; or with pit cars holding 1.5 to 2 tons, 1,600. With shafts over 200 ft. deep, to obtain a large tonnage it is advisable to hoist two cars at one time by double-deck cages, when the time gained over single decks is the difference between hoisting 6 or 7 ft. and hoisting the depth of the shaft. With cars holding 1.5 tons of coal in shafts not over 200 or 300 ft. deep the double-deck cage, with either of the top arrangements mentioned above, should hoist 2,000 tons, and with cars holding 2.5 tons, 2,400 tons per eight-hour day. Having the two cars on one deck of the cage saves at least three or four seconds compared with the double-deck cage. The writer thinks that from 2,000 to 2,400 tons can be obtained with cars holding 1.5 tons, and a larger amount with the larger cars. Two cars on one deck require a shaft of nearly double size and more than double cost.

The Spring Valley Coal Company, at its several plants, uses cars holding about 1.5 tons of coal. The net output at No. 1 mine, nearly 500 ft. deep, where it has double-deck cages, is 1,300 to 1,400 tons per eight-hour day, which, with the rock, is equivalent to 1,600 to 1,700 tons. This tonnage may not appear large compared with the tonnage of mines in central and southern Illinois, with the simpler self-dumper equipment. However, conditions are more favorable in the latter fields, where pit cars hold from 2.5 to 3.5 tons.

The necessity of more weight in the individual pieces than is strictly called for by the strain sheet is now apparent to most builders of tipples. As shaking screens will cause some vibration in their supporting frame unless the latter has excessive weight, and as the railroad track scales and the weigh-hopper scale-beams are customarily put in a weigh room on the tipple, it is now the usual practice not to connect the supporting frame to the main building.

The greatest working strain thrown on the structure is in hoisting, the loaded cages with the hoisting rope weighing from 2 to 4 tons with single cars, and from 6 to 8 tons for cages holding two cars. As hoisting engines are usually made with a considerable surplus of power, they are apt to pick up a cage with a jerk, and thus the strain may become from two to three times the dead load. Another great strain that may be thrown on the tower structure, and has to be considered in using rigid cages, comes from the pound of the cages landing on the chairs at the floor level. This may be very heavy with double-deck cages unless the engineer is careful; with self-dumping cages the pound is avoided, but there is considerable horizontal strain, due to the reaction in quick tipping and dumping. The most difficult problem is to take care of the horizontal strain from hoisting. The writer believes the hoisting engine should be placed a considerable distance from the shaft to sesure safety from any fire originating in the mine, and be away from any settlement of the surface about the shaft, but chiefly to ease the hoisting rope. When the rope sags slightly, there is a certain amount of give. The limiting inclination should be that at which the rope does not require rolls for its support. The writer has found an angle of 40° from the horizontal about right.

The resultant in hoisting bisects the angle between the vertical part of the rope and that running to the engines. In an extreme case, when by an over-wind the cage is lodged in an upper part of the tower, the line of the resultant would be almost directly along that part of the hoisting rope running to the engine drum, and the engine brace, usually run from the engine foundation to the sheave frame in wood tipples, then takes practically the whole strain. Some of the present steel tipples have the engine brace similarly placed; in others, it follows the line of the resultant. In many, the engine brace is not designed strong enough to break the hoisting rope before yielding. Although the writer always advises the use of detaching hooks, yet, to allow for their not working, he assumes double the breaking strength of the rope in figuring the ultimate strength of the structure. At the Cardiff No. 2 tipple, the hoisting rope is 1⅜ in. in diameter, of 'extra crucible steel,' with a breaking strength of 78 tons.

With wood structures not tied down to heavy foundations, the resultant should fall between the engine brace and the tower; but this need not be the case with steel structures, though the writer, like other engineers, did not at first fully realize the difference in material. The Cardiff No. 2 tipple is of novel design. The tower proper has an A-shaped frame, symmetrical with reference to the center line of the shaft. The legs are about 50 ft. apart at the bottom; the bracing is of struts inclined from the base to the center of the platform, and from the center of the platform to the center of the sheave deck. A second A-frame holds the sheaves. The feet, anchored to heavy concrete piers, are connected by heavy rods below ground, imbedded in concrete, and when the full strength of the tower is developed it is necessary to depend on the weight of the foundations under the legs away from the engine, to prevent overturning. The tower proves very stiff in operation and there is no vibration in hoisting.

The engine is at one end of the shaft, and the sheaves are one above the other. Most engineers put the engine at the side of the shaft, because it is easier to build a head-frame that way. The writer prefers to put the boiler house alongside the railroad track (so that, if desired, coal can be unloaded directly into the boiler house) and to put the engine house close by, thus requiring end-hoisting.

The writer offers these suggestions for details of the steel structure:

(1) Built-up pieces should be as simple and compact as possible; lattice work to be avoided. Angles or other pieces constituting a member should be offset when necessary to avoid small spaces, or fillers should be used.

(2) Rod braces should not be used. All light braces should be angle bars.

(3) Angles, plates and webs of all shapes should not be less than 5-16 in. thick, regardless of how light the strain may be.

(4) All main parts of the tower and the foundations should be kept as far back as possible from the shaft.

(5) The structure should be shipped in as large riveted sections as possible; field-bolts should be used in erecting, saving expense in comparison with field-riveting, and being an advantage if the structure is ever taken down for moving elsewhere.

(6) As responsible structural building concerns can give for the least money the best design suited to their shop, provided they have full knowledge of the requirements, it is advisable for the coal operator who may submit his own plans for bids to invite suggestions for improvement.

Two questions are usually asked by prospective builders. Is steel durable under mine conditions? And, Is the greater cost of the steel structure justified? The writer thinks that there is no question but that steel is more durable than wood. In this part of the country it has been put to a test of nearly 10 years without appreciable weakening, but a tipple should be painted yearly if near the shaft. Whether or not the first cost is justified for small plants is more open to argument. A steel tower and tipple complete will cost, approximately, double the price of a wood structure. Where, as in some places in Iowa, a shaft has only sufficient field to last 10 or 12 years, the average life of a wooden tower is sufficient. A steel structure put together with bolts, however, has a salvage value, and fire originating in a wood tower may destroy the shaft. In the latter event the mine could not ship for at least two months, causing a loss probably far greater than the cost of a steel tower. During the past year, several wood tipples have been burnt in Illinois.

There is nothing new under the sun, in the sense that there is nothing isolated and unrelated, nothing which has not already appeared in some cognate manifestation. This is the justification for the more serious scientific forecasts, since it is obviously permissible to argue that when a set of conditions appears similar to, but not identical with, a former set, a similar but not identical result will follow. It is a legitimate deduction, but the element of speculation exists in the difference which is presumed. The scientist who can best forecast this difference will be considered the best prophet.

APPRAISAL OF MINERAL LANDS.

Mr. H. M. Chance, in a paper to be read at the Lake Superior meeting of the American Institute of Mining Engineers, September, 1904, discusses the valuation of mines and mineral lands, especially with reference to coal lands, but the principles which he lays down are substantially applicable to the appraisal of all kinds of mineral lands, and are worthy of great consideration, inasmuch as there is a divergence of opinion respecting this subject and no well-defined rules of practice as guide to the engineer.

Among the methods which have been applied to this problem, Mr. Chance notes the following—the comments in brackets are our own:

1. Value is sometimes determined by adding to the cost of the land, the cost of the improvements and a reasonable remuneration to the party who has successfully developed the property.

This method may be dismissed without serious consideration, because it is impossible to determine what would be a reasonable profit, and no account is taken of the value of the business developed or the enhancement of land values.

2. Value is sometimes determined by comparison with the prices fetched by similar property recently sold in the same neighborhood.

This method is unscientific, and fails to recognize that the price paid for a property is a measure only of the value placed upon it by the vendor, who may be willing to part with it for much less than its real value, especially if he be not in a position to operate it.

3. A method elaborated by Mr. Joseph S. Harris has been adopted by many experts for general purposes. The total workable coal is first determined and valued at a certain sum per ton (net value over cost of mining, of course). Using as a basis the rate of increase in production, as shown by past experience, the probable yearly increase in output is calculated and the probable yearly revenue until all the coal is mined. The probable yearly earnings are then capitalized at their present money value by the usual formulas for deferred payments, at a certain assumed rate of discount.

As Mr. Harris clearly shows, the present money value of coal land depends largely upon the time at which development is to be commenced, the time elapsing before maximum output is attained, and the time to be occupied in exhausting the tract; the present money value decreasing rapidly as any of these variables is increased.

This method is most valuable as a basis upon which re-organization may be planned and a new company financed, but is not adaptable for general use, being cumbersome and not allowing for the value of established trade and connections.

(We think it may be adapted to general use by making a distinction between the value of the business and the value of the land, appraising each separately. It is not uncommon for mining companies which smelt their own ores to maintain separate mining and metallurgical organizations, the accounts of which are kept as distinct as if they were in no way affiliated. The smelting business may be continued by the purchase of ores from others after the original mines have been exhausted. A separate valuation by the Harris, or similar, method would therefore appear to be in such cases not only easily feasible, but also entirely advisable.)

4. A plan more generally used is to assume that the property can be operated at a certain yearly output, which can be maintained for a fixed term of years, without allowing for any increase in the output beyond what may be already in sight. The capitalized value of such yearly earnings is taken as the appraised value of the property.

This method is useful in a majority of cases as corroborative of valuations reached by the fifth method.

(The above method is not infrequently employed in the valuation of metal mines. Suppose a certain mine has 1,000,000 tons of probable ore, and is producing 100,000 tons per annum at a profit of $1 per ton. Capitalization on the basis of five annual profits would give a valuation of $500,000. A purchaser at that figure would in 10 years be reimbursed his investment at the rate of $50,000 per annum, and would receive 18 per cent interest per annum, not on the original investment, but on what remained each year after redemption of 10 per cent of the principal, which would not be an extravagant return, taking into account the inevitable risks of mining.)

5. Another method is based upon the actual earnings and the ability to maintain an output at an increased rate for a long period. Should the value so reached be greatly in excess of the appraised obtained by valuing the lands at what they are fairly worth, plus the value of plant and improvements, it is evident that the earning capacity is too highly valued. This method consists, therefore, merely in the assumption that the business, including plant and property, is reasonably worth a sum upon which the yearly net earnings will pay a satisfactory return.

(We do not see wherein this method differs materially from the fourth. The more precarious and shorter-lived a business appears to be, the greater is the annual return expected. In capitalizing a business on the basis of five annual profits, there is a return of 20 per cent per annum, not allowing for amortization. A capitalization on basis of eight annual profits gives a return of 12.5 per cent. A determination of the conditions is naturally a requisite to the formation of an opinion as to what might be a proper return in each case, but the investor is the only judge of what is, or is not, satisfactory to himself.)

In order to confirm the valuation determined by the fifth method, separate appraisals in detail should be made, showing the value of the lands, plant and improvements.

When the mine has a reasonably long life, the plant and improvements, if adapted to economic operation, and in good repair, may be fairly appraised at first cost, or at present cost of replacement. Underground developments should also be computed at cost of duplication, unless the probable life of the mine be short, when a material reduction must necessarily be made from the appraised value.

(Mr. Chance writes avowedly with especial reference to coal mines, while our comments have been made from the standpoint of the metal miner. However, we conceive that the principles governing the valuation of coal and metal mines are substantially the same, save for the condition that the probable produce can be forecast usually with more certainty and further ahead in the case of the former than in that of the latter.

In the valuation of great metalliferous deposits, which have been delimited, or nearly so, and are known to have a very long life, i.e., a long period before exhaustion in the prosecution of extraction in a normal way, the third method of valuation is worthy of considerable application, but great judgment must be used in fixing the proper rate of discount.

Most frequently in valuing mines of which the life and future prospects can not so well be determined, the fourth method is employed. No definite rule of capitalization can be laid down; 12.5 per cent may be reasonable in one case and 25 per cent none too high in another. Mines are very apt to be valued too high. When finally their shares are listed on the stock exchanges and sell on as high as a 5 or 6 per cent basis, the purchaser is not figuring on any reimbursement of his principal out of the dividends, but is relying on his foresight and shrewdness to sell out at an advance, or at least at cost, in ample time.)

SMELTER SMOKE AND AGRICULTURE.

By JOHN A. WIDSOE.*

The total annual value of Utah farm products is $17,000,000, while the value of the annual output of the mines is $34,000,000. Occasionally the interests of the two industries clash, and during the last two years the operations of the smelters near Salt Lake City have led to many complaints from farmers. This bulletin gives the results of investigations made through the season of 1903, from June to October, and is believed to be the first investigation of the kind in an arid district where irrigation agriculture is practiced.

The district affected by smelter smoke lies near Murray, where is the Highland Boy smelter, and Bingham Junction, where are the Bingham Consolidated and United States smelters. The Jordan river flows past the smelters, and the district, embracing river bottoms and benches, is thickly covered with farms and one of the oldest settled in the State. The area between the two sets of smelters was studied especially that the worst effects of the smelter smoke might be known.

It was found that farms in the path of the prevailing winds suffered most. Shade trees were variously affected; the chief damage was evidently done in early spring while the leaves were tender. Of fruit trees, pears were most affected, and plums least; here again the chief damage was evidently done early in the spring, and the poor conditions of some orchards was plainly due not so much to smoke as to lack of proper care by the owners. Of small fruits, strawberries were affected most. Among vegetables, potatoes were most subjected to injury; of field crops, corn was most resistant, the smoke affecting it slightly. The lucern crop of the district seemed to equal the average crop of the State, though a field freely exposed to the smelter yielded about seven-tenths of the average.

The general conclusion was that on farms lying in the direction of prevailing winds all kinds of vegetables were injured somewhat, but this injury, with most crops, was far from a total loss of the crop, and the asserted injury to all farms within a given radius of the smelters has evidently been greatly over-estimated. Farms not in the line of prevailing winds are not affected adversely at all.

The substances emitted by the smelters were investigated. The most important was sulphur dioxide, the observed amounts in the smoke flowing from the smelters varying from 93 parts in 10,000, near the smelter, to amounts too low to be determined. Special dust col-

*Abstract from *Bulletin* 88, of the Utah Agricultural College.

lectors made were found to collect completely solid particles in the air. Chemical examination showed the flue-dust to contain a large quantity of iron, some copper and traces of arsenic.

Examination of soils showed no evidence of the effect of sulphur compounds in the smelter smoke, and it is clear the sulphur dioxide emitted does not injure the soils. Traces of arsenic were found in analyzing some soil samples, but the effect of flue-dust on the composition of soils is so slight as to be negligible. The amount of copper added to the soil would be about 0.04 per cent in 10 years, the amount of arsenic one-hundredth or one-thousandth as much. European experiments show that copper in insoluble form, as is most the copper in flue-dust, begins to affect soils when only 1 per cent has been added, while less than 0.025 per cent of arsenic has no effect.

Investigation further showed that the flue-dust of the smelter smoke had little, if any, part in causing the crop injuries observed in the district, and practically the whole question of crop injury narrows down to the effects of sulphur dioxide, even one part of which in 1,000,000 parts of air, if applied continuously and long enough, has been found to be injurious. The effects are most severe in a damp air or with moistened plants. Young plants and the tender parts of plants suffer most. As the air in Utah is extremely dry, however, it seems likely that the damage done by the sulphur dioxide is relatively small.

Regarding effects on animals, it was claimed in the district that the flue-dust rendered hay unfit for use, and animals died from eating it. Careful examination of lucern hay grown on the field most seriously affected, however, showed remarkably small amounts of copper and arsenic in the hay, quantities far below the danger limits given by standard books. The amounts, if trebled, would not call for very serious notice. Feeding tests made on cows showed that the nutritive value of lucern hay grown near the smelters was not impaired.

It cannot be denied, however, that the smoke carries amounts of arsenic and copper that are poisonous in considerable quantities, and it may be possible that water from melting snow may carry to some lower lying place a large amount of dust that has accumulated during the winter. A portion of the arsenic and copper may become soluble, and when the water in the pools is concentrated by evaporation, it may be poisonous to animals drinking it.

One conclusion is that when the wind causes the smoke to beat on a field for a considerable time, the crops may be severely injured, this injury being due to the sulphur dioxide in the smoke rather than to any solid matter in the flue-dust. Farmers can reduce the possible damage by not irrigating crops when the wind blows from the smelters.

The development of abstract ideas among the Greeks preceded the concrete knowledge of natural phenomena.

All our inductions are incomplete; there is a permanent possibility of some unseen element which has been omitted. In practical life and in ordinary speculation we assume the substantial adequacy of our knowledge. But the scientific prophet is justified in assuming the contrary, if he pleases, and if he speculates on the existence of error, there is always the chance that some unlooked-for circumstance may crop up to support him.

BOOKS REVIEWED.

Die Roheisen. Vol II. Part I. Vienna, Austria, 1904: published by the Ministry of Commerce. Pages, 500.

This publication contains statistics relating to the world's production of coal, iron ore, pig iron and iron wares, the iron consumption of all countries, imports, exports, etc. The statistics are compiled from figures collected by government officials, the aim being evidently to produce a work that will be regarded as authoritative. This instalment of the work takes up the nations that are not in the first rank in total output, beginning with France, then the lesser European iron producers, and ending with the South American countries and French and German colonies. The statistics are elaborate and systematically arranged, and are in some cases brought down to 1902, many tables showing in detail the production of the more important countries for the decade 1892-1901.

Report of the Indiana Department of Geology and Natural Resources. 1903. W. S. Blatchley, State Geologist. Indianapolis, 1904: State Printer. Pages, 365; illustrated.

This report, the twenty-eighth, issued by the department, contains a short description of the topography of Indiana and of the different rock formations of the State; reports on the petroleum, lime, coal and gas industry for 1903; a physiographic study of the Winona Lake region and an account of the stratigraphy and paleontology of the Niagara of northern Indiana. Accompanying the report is a good geological map of the State, data for which had been gathered during the past nine years, or since Mr. Blatchley assumed charge of the department. This map is on a scale of 4 miles to the inch, and the boundary lines between the different formations are shown as accurately as possible. The map reflects credit on Mr. Blatchley's patience and industry.

Regarding the mineral resources of the State it appears that the output of Indiana oil in 1903, reached the great total of 9,177,722 bbl., which, at an average market price of $1.14 3-20 per bbl. brought the producers $10,476,369. The coal industry has grown rapidly within the last five years. In 1903, 9,992,553 tons were mined in the State, of which 1,025,940 tons were block coal. Owing to various causes, including the anthracite strike in Pennsylvania, the demand for coal was extraordinarily large during the year, mine-run bituminous selling in January at $3.60 per ton at the mines in Vermilion county. The production was the largest on record.

The book is better printed and contains better cuts than many State reports. It is a good report.

A Text-Book of Coal-Mining. Fifth Edition. By Herbert W. Hughes. London, 1904: Charles Griffin & Company. Pages, 563; illustrated. Price, $7.

There are a number of text-books treating of coal mining from the standpoint of British practice, and several of them have gained a popularity that calls for successive editions. Of these the one written by Mr. Hughes is perhaps the best. It occupies a position by itself between Kerr's shorter treatise and Pamely's more elaborate handbook. This edition, the author says, has been thoroughly revised and somewhat enlarged, the additional matter relating more especially to the use of compound and electric hoisting engines, and the application of central condensation stations. This has naturally resulted in an increase in the number of illustrations.

One of the chief merits of Mr. Hughes' book is that, though written from a British standpoint, it gives much space to foreign practice. The author has not only a wide acquaintance with the literature of coal mining, but he has that practical acquaintance with the art which enables him to select what is best, and he also has enough literary ability to condense into interesting narrative the descriptions of the manifold methods and devices that are comprehended under that commonplace term, coal mining. The new matter in this edition deals to a considerable extent with German practice, and tells of the surface equipment and electrical appliances used at some of the much-described German collieries, such as the Preussen II and Gelsenkirchen. Comparatively little is said about American practice, but this is not strange, as in most of the coal-fields of this country the coal seams worked are at shallow depths, of good thickness and comparatively easy to mine. Hence American practice has been chiefly toward attaining large output, while owing to the low price of coal, fuel economy has been studied comparatively little. The British and European mines working under more difficult conditions have developed greater refinements of methods. For this very reason, however, Mr. Hughes' book will be found serviceable by American colliery engineers, not so much because they are likely to imitate foreign practice as because they will find in the book in convenient form a great mass of information from which they can get useful hints and suggestions.

Cements, Mortars and Concretes; their Physical Properties. By Morgan S. Falk. New York, 1904: M. C. Clark. Pages, 176; illustrated. Price, $2.50.

The enormous growth of the portland cement industry in this country is naturally resulting in the growth of our literature dealing with limes and cements. Ten years ago there were not more than two or three good works by American authors, the most important being Gilmore's treatise. Now the cement industry, in addition to all the articles that appear in engineering papers, and in the proceedings of engineering societies, supports several periodicals, while books on cement promise to be as numerous as any student of the subject can desire. Mr. Falk's work is something of a departure. It is not a treatise on materials and methods of manufacture. Instead, the author has tried to set forth as concisely as possible the physical properties of cement and cement mixtures, with especial reference to those properties which concern the engineer. The data presented are classified in seven chapters, thus: Chemical properties of cement; physical tests; general physical properties; elastic properties in general; tensile properties; compressive properties; flexural properties. An appendix contains the report on uniform tests of cement by the special committee of the American Society of Civil Engineers, and an abstract of Clifford Richardson's theory of the constitution of portland cements. The author gives the sources from which the important experimental data are obtained. He has made free use of the reports of the Watertown arsenal

and of the civil engineering societies, and includes the results of experiments, not previously published, made under his direction in the laboratories of Columbia University.

The result shows that the author has a wide acquaintance with the literature of cement, and has selected data with judgment. The book should prove of interest to users of cement in many ways, and will doubtless be needed in the laboratories of all cement works. As an instance of its worth may be cited the author's statement that "it is believed the results relating to the elastic properties of the material, such as the values of the co-efficients of elasticity and the ultimate strengths, have been so analyzed that their values may be determined in advance for any mixture within small limits of error." This alone should make the work a handy addition to an engineer's library. The book is neatly printed.

BOOKS RECEIVED.

In sending books for notices will publishers, for their own sake and for that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of this JOURNAL.

Experiments for Students in General Chemistry. By Edgar F. Smith and Harry F. Keller. Philadelphia, Pa.: P. Blakiston's Sons & Co. Pages, 94; illustrated.

New South Wales Statistical Register for 1902 and Previous Years. T. A. Coghlan, Government Statistician. Sydney, N. S. W.: Government Printer. Pages, 1,136.

Report of Indiana Department of Geology and Natural Resources, 1903. W. S. Blatchley. State Geologist. Indianapolis, Ind.: State Printer. Pages, 565; illustrated.

Review of the World's Commerce for 1903. Washington, D. C.: Government Printer. Pages, 265.

COAL IN THE CENTRAL PROVINCES OF INDIA.—The Indian Government has been carrying on boring operations at Ballarpur, near Chanda, for three years, and has proved the existence of a thick coal seam at varying depths, under an area of 2 square miles. A vertical shaft 15 ft. in diameter is expected to reach coal at a depth of 200 ft. The best samples from bore holes gave: Fixed carbon, 55 and 60 per cent; ash, 12 and 8 per cent, respectively. The nearest railway is at Warora, 40 miles distant, but a proposed line has been surveyed to connect Ballarpur with the Warora branch, while another road has surveyed a proposed line to Chanda and Ballarpur. Tata & Sons, of Bombay, did some prospecting in the same district, but without much success. There has been also a considerable amount of prospecting done in the Pench valley, Chindwara district, where a large area containing several seams of coal has been proved. Shaw, Wallace & Co., Calcutta, and others, have secured concessions, and work will shortly begin in the field.

The modern percussion tools used in drilling for oil and gas, the jars, casing, etc., were, in all essential details, invented for boring salt wells in the Great Kanawha valley, W. Va., between 1806 and 1832. These salt wells often produced petroleum, and this petroleum was collected and sold many years before Col. Drake completed the first well sunk for petroleum alone at Titusville, Pa., on August 28, 1859.

ABSTRACTS OF OFFICIAL REPORTS.

Rochester & Pittsburg Coal & Iron Company.

This company owns extensive coal and ore properties in western Pennsylvania. It is a subsidiary corporation, the stock being owned by the Buffalo, Rochester & Pittsburg Railroad Company. The report of that company gives the following statements for the year ending June 30, 1904. The railroad itself derives most of its business from coal and other mines and from the blast furnaces and mills of the region through which it passes.

The total tonnage of the railroad last year was 7,619,349 tons, 81.4 per cent being of minerals. The mineral freight carried was, in short tons:

	1903.	1904.	Changes.
Anthracite	55,102	77,190 I.	22,088
Bituminous	5,126,314	4,907,543 D.	218,771
Total coal	5,181,416	4,984,733 D.	196,683
Coke	795,307	651,750 D.	143,557
Iron ore	187,219	251,294 I.	64,075
Other mine products	197,987	242,225 I.	44,238
Salt	71,900	69,601 D.	2,299

The average train-load of freight was 441.46 tons in 1903 and 439.03 tons in 1904; a decrease of 2.43 tons. The average rate received was 0.531c. per ton-mile in 1903, and 0.541c. in 1904; an increase of 0.010c. per ton-mile.

The report of the railroad company says:

"The loss of tonnage was caused, in part, by the failure of connecting carriers to promptly receive the freight offered during the winter months, due to the unprecedented severity of the weather; and in part to the reaction from the abnormally large business of the preceding year, growing out of the strike of the anthracite coal miners. The operation of Adrian furnace produced gains in iron ore and pig iron. . . .

"The surplus of the Rochester & Pittsburg Coal & Iron Company for the fiscal year amounted to $598,872, out of which dividend No. 9, of 8 per cent, was declared, and the amount, $320,000, credited to the profit and loss account of the railroad company. The above surplus was arrived at after taking from the net earnings $120,333 principal of bonds paid off. The company has charged to profit and loss account $387,904, being the entire amount expended during the year for mining machinery, buildings, equipment, development of mines and sundry miscellaneous items.

"The Adrian blast furnace at Falls Creek, Pa., was completed at a cost of $613,498, and put in operation in August, 1903. To provide for the additional amount expended for the furnace, and also for further disbursements on account of the cost of the securities of the Consolidated Coal & Iron Company and of the Indiana County Coal Company, the company sold during the fiscal year $250,000 of its 4.5 per cent sinking fund gold bonds, leaving in the treasury $750,000 of the $2,000,000 issue referred to in last year's report."

Alaska Treadwell Gold Mining Company.

The great property owned and operated by this company on Douglas Island, Alaska, has long been famous as an example of what can be done in working low-grade ores at a profit. This report covers the year ending May 31, 1904. The capital stock is $5,000,000 in shares of $25 par value.

During the year the exploration and development work amounted to 9,372 ft., including 2,733 ft. of drifts, 415 ft. of cross-cuts, 4,051 ft. of raises, 1,281 ft. of intermediate drifts, 759 ft. of stations and 133 ft. of shaft sinking. The total amount is the largest since the mine was opened. Compared with the preceding year, the increase was chiefly in raises. Some features of the work were a raise connecting the bottom of No. 4 open pit with the 220-ft. level, doing away with tramming on the 110-ft.; a raise from No. 4 west drift of the 330-ft. level to connect with the No. 5 west drift of the 220-ft. level, for conveying ore to the 330-ft.; the connecting of No. 1 east drift with No. 2 east drift on the 600-ft. level so that the mechanical haulage system can be used to best advantage, and the connecting of the main east drift on the 750-ft. level with the bottom of the Alaska United shaft on the 700-ft. claim, furnishing excellent ventilation for the level.

The following table shows the earnings and expenses for the year:

	Amount.	Per Ton.
Bullion from mill	$892,888	$1.1519
Bullion from sulphurets	936,620	1.2083
Interest	3,916	.0051
Commercial profits	61,661	.0795
Total receipts	$1,895,085	$2.4448
Mining	$ 753,720	.9724
Milling	122,658	.1583
Sulphurets	113,236	.1461
General expense, Douglas Island	17,914	.0231
San Francisco Office	6,908	.0089
London Office	1,253	.0016
Paris Office	230	.0003
Consulting engineer	1,183	.0015
Bullion charges	8,214	.0106
Taxes	2,880	.0037
New construction and repairs	36,389	.0469
Total expenses	$1,064,585	1.3734
Balance, net earnings	830,500	1.0714

To the net profit for the year as shown above is to be added $682,657 brought forward from 1903, making a total of $1,513,157. From this total four regular and two extra dividends were paid, amounting in all to $525,000; and the sum of $160,000 was written off for depreciation, and $524 for worthless accounts at Douglas Island, leaving a balance to be carried forward of $1,513,157.

The company has two mills. In the old mill of 240 stamps, run part of the time by water power and part of the time by steam, water power was used 167 days and 21 hours, and steam 174 days and 1 hour, a total running time of 341 days and 22 hours. This mill crushed 370,648 tons of ore, an average of 4.52 tons per stamp per day. A shortage of battery water and a forced shut-down of the steam power plant reduced the running time in March and April. The 300-stamp mill, which uses water power only, ran 244 days and 7 hours, crushing 404,502 tons of ore, an average of 5.5 tons per stamp per day. The average crushed by the two mills was not quite 5 tons (4.99) per stamp per day. The total amount stamped was 775,150 tons.

In the mine 939,137 tons of ore were broken during the year, of which 774,575 tons were sent to the mill. The increase in the stock of broken ore amounted to 164,562 tons. The estimate of ore reserves, including ore that must remain as pillars, was, at the close of the year: Above 220-ft. level, 459,826 tons; above 330-ft. level, 886,676; above 440-ft. level, 314,267; above 600-ft. level, 991,773; above 750-ft. level, 791,585; broken ore in pits and stopes, 573,162; total, 4,017,289 tons. Of the ore sent to the mill 43.7 per cent came from pits and underhand stopes above the 110-ft. level and 26.2 per cent from stopes on the 440-ft. level.

During the year an average of 37.5 machine drills were at work daily in the mine, 18.5 being employed on stoping, 9 on development, 7 in pits and 3 in cutting out. The total number of feet of holes drilled in the mine was 917,136, and the number of tons of ore

broken was 939,137, making an average of 1.02 tons of ore broken for every foot drilled. The average work of a drill per 10-hour shift was 33.55 ft. of holes.

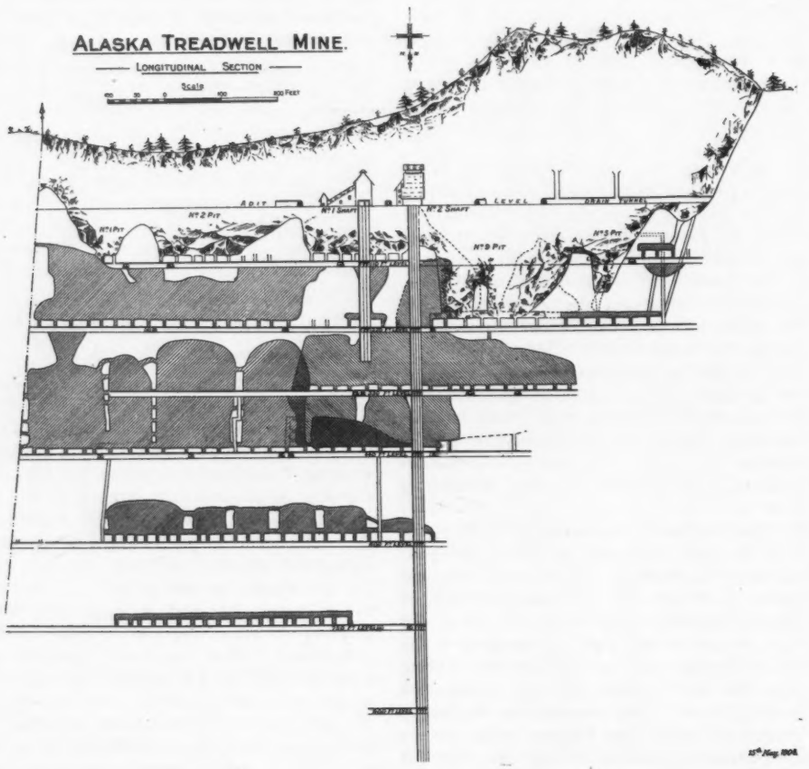
A map which accompanies the report shows the amount of work done in the mine to date; it is reproduced herewith.

During the year 4,217 samples were taken in the mine; these gave an average assay value of $2.16 per ton. From the ore sent to the mills 15,663 tons of sulphurets saved by concentration from tailings were sent to the Tacoma smelter for treatment, with the result shown in the table.

During the year the foundry produced 482,627 lb. of iron castings and 5,652 lb. of brass castings. The machine shop ran to its capacity, and many things heretofore bought, such as skips, ore cars, and hoisting sheaves, are now made at the shop. Regarding additions to plant, the report says that preliminary to the installation of a new main hoisting engine at No. 2 shaft the head frame as well as the crusher house was practically reconstructed to receive two additional crushers for the double crushing system. This system as installed is as follows: The rock, when hoisted from the mine, is dumped upon a grizzly, with 5-in. spacing between the bars, the oversize going to two Comet E crushers; the undersized and crushed product from the upper crushers falls on a second grizzly with bars set 2 in. apart. the oversize going to a lower part of No. 6 Gates crushers, and the undersized and crushed product from the lower product falling into the storage bins. By this system the ore can be crushed much finer than formerly before sending it to the mills, and a higher duty per stamp is expected.

A duplex Worthington pump, with 15-in. water end, 17-in. steam end, and 15-in. stroke, and a capacity of about 2,000 gal. per min., was installed on the 220-ft. level to handle the water from the open pits. A new Bullock dynamo driven by a direct-connected Pelton water-wheel was added to the equipment. The railroad track and trestle was extended from the upper to the lower powder magazine. A Buffalo Forge Co. blower, with a capacity of 3,700 cu. ft. of air per minute, was placed at the shaft on the 750-ft. level, to ventilate the 900-ft. level until connected with the level above. A Little Wonder air-hammer rock drill is being tested, and if satisfactory will reduce decidedly the consumption of powder in bulldozing and similar work.

Skilled labor was scarce throughout the year. Machine drillers in the pits received $3.50 per day, with board and lodging; underground they received $2.50, with board and lodging. There were 29 accidents during the year; 9 men were killed and 4 seriously injured; 15 accidents were due to falls of rock, while 3 men were killed and 1 was seriously injured by the breaking of a new sheave wheel.



PRODUCTION OF BORAX.—According to the report of Charles G. Yale to the United States Geological Survey, the amount of crude borax produced in 1903 was 34,430 short tons, valued at $661,400. The value given is much lower than the total reported for 1902, due to the fact that it is calculated for crude product, whereas last year the valuation was partly for refined borax.

FELDSPAR IN UNITED STATES.—The production in 1903, according to the United States Geological Survey, was 13,432 short tons of crude, valued at $51,036, and 28,459 tons ground feldspar, valued at $256,733. In 1902 the output was 21,870 tons crude, valued at $55,501, and 23,417 tons ground feldspar, valued at $194,923. Five States were producers—Connecticut, Maine, Maryland, New York and Pennsylvania.

QUESTIONS AND ANSWERS.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc. Preference will be given to topics which seem to be of interest to others besides the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Soapstone.—What is the output of soapstone in the United States, and where would a miner find the most remunerative market? Should the mineral be shipped as mined, or ground to realize the best price?—S. E.

Answer.—In reporting statistics of production it is customary now to include common talc with soapstone, as they are kindred minerals. In 1903 the output of both was 26,671 short tons, valued at $418,460 at mine, which is somewhat less in quantity than the three previous years. Roughly, about one-quarter of the production last year was marketed as common talc. In detail, the 26,671 tons reported were distributed as follows: Rough stone, 2,908 tons, valued at $23,704; sawed into slabs, 2,027 tons, $33,800; manufactured articles, 12,219 tons, $274,978; ground, 9,517 tons, $85,978. The bulk of this has come from Virginia and Maryland. The uses of soapstone are numerous, and its value graduates with the demand for both lump and powder. A good quality of lump soapstone is used extensively in the manufacture of utensils that are exposed to high temperatures or to the action of corrosive liquids and gases. A remunerative trade is also done in soapstone tubs; fire-bricks for stoves, heaters, etc.; hearthstones, mantels, sinks, slate-pencils, gas tips, insulators for electric conductors, etc. These are all relatively high-priced articles. Were the production of soapstone valued on this basis, instead of an arbitrary price of $10 per short ton at mine for rough stone or sawed slabs, the statistical position of the industry would be greatly magnified. In collaborating the figures of output for THE MINERAL INDUSTRY the value of $10 per ton at mine has been chosen for the crude mineral after careful consideration of the selling prices of the finished articles, less the cost of labor.

COAL MINING IN ORANGE RIVER COLONY.—The coal output of this colony has been small, but development is now under way near Wolochoek, where a company is sinking two shafts to open what is believed to be a good seam of coal, at a depth of 400 ft. Good coal is reported found south of Wolochoek.

COAL MINING IN PENNSYLVANIA.—Statistics published by the Pennsylvania bureau of labor show that the total output of anthracite coal in 1903 was, from collieries, 64,595,664 gross tons, and from washeries, 3,338,190 gross tons. The average number of persons employed in the production of anthracite was 157,995, and the wages paid amounted to $77,624,281. The washeries employed 1,715 working people, who earned $698,461. In dredging coal from the rivers 317 persons were employed, earning $68,890. This makes the total number of persons employed in the production of anthracite 159,985, who received in wages $78,391,632. The total tonnage of bituminous coal in Pennsylvania in 1903 was 101,113,290 net tons, worth $128,991,363 at the mines.

RECENT DECISIONS AFFECTING THE MINING INDUSTRY.

SPECIALLY REPORTED.

PARTIES BOUND BY STIPULATION AS TO FINDING OIL IN PAYING QUANTITIES.—A stipulation in an oil lease that the term shall continue as much longer thereafter as oil or gas shall be found in paying quantities, requires oil or gas to be actually discovered in paying quantities within the term of the lease.—Murdock-West Co. v. Logan (69 *Northeastern Reporter*, 984); Supreme Court of Ohio.

RIGHT TO SELL MINING LOCATION.—A valid location of a mining claim in compliance with the statutes has the effect of a grant from the government of the right to the exclusive possession of the land, and is such property as may be sold and transferred.—Worthen v. Sidway (79 Southwestern Reporter, 777), Supreme Court of Arkansas.

LIABILITY WHERE DEFECT IS NOT SO GLARING AS TO FORBID USE.—Where the defects of an implement with which an employee is required to work are not so glaring as to threaten immediate danger, and are not such that a person of ordinary prudence would not have used the implement, an employee injured thereby is not precluded from recovering against the employer on the ground that he was guilty of contributory negligence.—Robbins v. Big Circle Mining Co. (79 Southwestern Reporter, 480), Appellate Court of Missouri.

KENTUCKY LAW REGARDING PAY-DAY FOR MINES NOT VIOLATION OF POLICE POWER.—The law of Kentucky (Statutes 1903, Section 2739) requiring persons and corporations engaged in mining to pay all employees on certain days of each month to within fifteen days of such dates, unless prevented by unavoidable casualty, forbidding blacklisting, and declaring that a violation of such act shall be a misdemeanor, is not objectionable as an improper exercise of the police power. Nor does it impose a penalty for the nonpayment of a debt.—Commonwealth v. Reinecke Coal Mining Co. (79 Southwestern Reporter, 287), Supreme Court of Kentucky.

MINOR LABORER PRESUMED TO HAVE NOTICED ACCORDING TO AGE, ETC.—Where a laborer was employed as a shoveler on the dump of a quartz mill, receiving a shoveler's wages, and was put to work in a dangerous place in the mill, and was required to perform labor on machinery with which he was not familiar, it could not be said that he accepted all the ordinary risks incident to the work, nor that every risk that he could see and guard against was a risk incident to the work; but he would be presumed merely to have taken such notice of patent and obvious danger as would be reasonably expected of a person of his years and experience.—Merrifield v. Maryland Gold Quartz Mining Co. (7 Pacific Reporter, 710), Supreme Court of California.

EMPLOYER NOT LIABLE FOR INJURY CAUSED THROUGH DEFECTS CAUSED BY FELLOW SERVANTS.—In an action by an employee against his employer for personal injuries received as the result of the breaking of a rope on which he was descending, with his foot in a loop, to the bottom of a mine shaft, where it appears that ladders were furnished for the purpose of descending, and were near, and there was no reason why he should not have used them, his injuries are the result of his own negligence. The misuse of such rope by such party and his fellow servants having rendered it defective, without the knowledge of the employer, was the negligence of the employees, and the employer not liable for such defect.—Cribben v. Yellow Aster Mining & Milling Co. (75 Pacific Reporter, 839), Supreme Court of California.

LIABILITY WHERE INJURY OCCURS THROUGH ACT OF PARTY INJURED.—Where one was employed in removing stumps serving as roof supports in a mine, the owner was not liable for injuries caused by the fall of débris from a point in the roof in such close proximity to the part of the mine where such workman was engaged as to be affected by the blasting done by himself, and which caused the roof to fall, unless the mine superintendent knew or should have known that such blasting would have caused the top of the mine to fall, and negligently failed to guard against its falling by propping it more securely, and the workman did not know, or by ordinary care could not have known, that such would be the effect of his blasting.—East Jellico Coal Co. v. Golden (79 Southwestern Reporter, 291), Supreme Court of Kentucky.

PARTIES SELLING MINING CLAIMS MUST PERFECT TITLE OR BUYERS LOSE.—Abandonment of a mining claim is a matter of intention, and takes place at once whenever a miner gives up his claim and leaves it without any intention of repossessing it, and regardless of what may become of it, or who may appropriate it, and in such case the property reverts to its original status as a part of the unoccupied public domain, and becomes open to location by the first comer. Where the owners of three-fourths of a mining claim had abandoned the same, and authorized another to locate thereon, a statement by the owner of the remaining one-fourth to one of the abandoning owners that he did not care to have anything more to do with the claim constituted an abandonment by him of his interest in the claim, and was a ratification of the act of his coowners in permitting another to locate a claim on same. A conveyance from the original locator and possession thereunder cannot ripen into a perfect title unless the original locator secures title from the government, and the right of possession in the grantees in such conveyance exists only while the locator or the purchasers from him, with notice, remain in possession, and terminates as soon as the locator abandons the claim.—Conn v. Oberto (Colo.), 76 Pac. Rep., 369.

A SIMPLE SAND WASHER.*

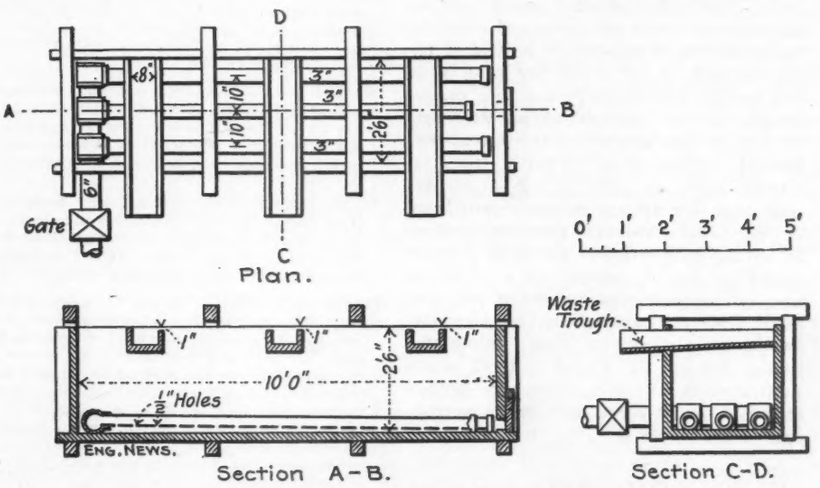
BY F. H. STEPHENSON.

Specifications for certain work now being done at Yonkers, N. Y., called for sand of the following character:

The effective size shall not be less than 0.25 mm. nor more than 0.35 mm. The uniformity co-efficient shall not be more than 3.0. The sand shall be from dust and shall not contain more than one per cent finer than 0.13 mm., and shall be entirely free from particles over 5 mm. in diameter.

The sand pits near the work carried too large a percentage of material finer than 0.13 mm. Mr. Allen Hazen therefore designed an apparatus to wash out the excess of fine material.

The apparatus consists of a wooden box with inside dimensions of 10 by 2.5 by 2.5 ft. In one end is a 6-in. pipe, out of which lead three 3-in. pipes capped at the ends, extending nearly the length of the box. In the bottom of the 3-in. pipes are 0.5-in. holes spaced



APPARATUS FOR WASHING BANK SAND.

6 in. between centers. Outside the box on the 6-in. pipe is a controlling gate. At the opposite end of the box from the 6-in. pipe is bored a 3-in. hole. A sliding wooden door allows this hole to be open or closed. Three overflow troughs are provided.

In operation, the gate on the 6-in. pipe is opened and the box filled with water. Sand, with the particles over 5 mm. in diameter removed by screens, enters the box at the end, *A*. The upward currents of water from the holes in the 3-in. pipes tend to keep the sand in a state of suspension and water overflowing into the waste troughs carries with it fine particles of sand.

When the box is partly filled with sand the sliding door at the end, *B*, is opened and the heavier and coarser sand flows out. By manipulating the door, the sand can be made to flow out with a very small percentage of water.

The results have been very satisfactory. The unwashed sand carried from 2 to 7 per

*Abstract of article in *Engineering News*, July, 1904.

cent (average 4.5 per cent) of material finer than 0.13 mm. The sand after washing averaged only 0.6 per cent of fine material. In 10 hours this apparatus has several times washed 200 cu. yd. of sand.

NEW MOLYBDENUM COMPOUND.—At a recent meeting of the Academy of Sciences of France, M. Henri Moissan described the preparation and characteristics of a new carbon compound containing molybdenum and obtained by heating charcoal with melted molybdenum and aluminum in an electric furnace. The resultant metallic mass is treated with a concentrated solution of potash, when well-defined needle-shaped crystals of the new compound are obtained. The substance is very hard, is hardly attacked by acids other than nitric, and is not decomposed by water or steam at a temperature below 600° C. It resembles the carbide of tungsten, which is not surprising, since tungsten and molybdenum are much alike. It is thought the new compound may be useful in making molybdenum steels.

GOLD DREDGING IN VICTORIA.—During 1903 there were 15 bucket dredges, 20 hydraulic pump sluices and 5 hydraulic jet elevators in operation on the rivers of Victoria. The bucket dredges worked for an aggregate period of 598 weeks and raised 3,100,824 cu. yd. of material for a yield of 14,553 oz. gold, or 2.5 grains per cubic yard. The average weekly return was 24⅛ oz. per dredge. The 20 hydraulic sluices were operated for an aggregate period of 697 weeks and handled 4,528,944 cu. yd. of earth. They recovered 22,500 oz. gold, or 2.38 grains per cubic yard, the average weekly return being 32.3 oz. The 5 hydraulic elevators, working for an aggregate period of 130 weeks, handled 150,208 cu. yd. of material for a return of 1,104 oz., an average of 3.46 grains per cubic yard. The weekly average for each plant was 8.4 ounces. In all, the plants enumerated treated 7,782,976 cu. yd. of material which yielded 38,157 oz. gold. The area worked amounted to 240 acres, showing an average yield of 159 oz. per acre.

PROPOSED COAL TRUST IN SPAIN.—It is reported that a group of capitalists largely interested in Spanish coal mines have formed a committee with a view to amalgamating all these mines under the management of one company, with a capital of about £8,000,000. A circular drawn up by the committee has been sent to the proprietors of all the coal mines at present worked in Spain. It appears from this circular that 2,700,000 tons of coal were produced in Spain during 1903, while the consumption during the year was 5,500,000 tons, the deficit being obtained from the United Kingdom at a cost of about £3,200,000. The average rate for shipment of coal from British to Spanish ports is 5s. ($1.25) a ton; the Spanish railways charge, for a journey of 500 kilometres (equal to 310 miles), 3 centimes per ton per kilometre (equal to 0.96c. per ton mile). The railway rate from Gijon to Saint Sebastian is 9 pesetas (about $1.74). The founders of the proposed Trust intend, if their efforts are successful, to improve the present methods of production, and lessen the cost of mining. They hope to increase the annual output to 5,000,000 tons, which will be nearly sufficient to meet the needs of the country. The committee will likewise endeavor to bring about a reduction in the railway rates for coal, thus lowering its price and causing a demand in districts where, at present, the cost is almost prohibitive.

PATENTS RELATING TO MINING AND METALLURGY.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ending September 20, 1904.

770,283. ORE CONCENTRATOR.—Abel Guionneau, Denver, Colo., assignor of two-thirds to Charles M. Fueller and Robert J. Cory, Denver, Colo. In a reciprocating table-concentrator a flat, smooth table-surface provided with several rows of inverted conical cups extending from the head-end portion of the table throughout a portion of each table's length, each row of cups being connected together with a sunken groove or riffle.

770,285 and 770,286. MINING-MACHINE.—William E. Hamilton, Zanesville, Ohio. A mining-machine comprising an elongated frame pivotally mounted at one end and having a cutter-frame pivotally mounted on its other end, and a cutter on said cutter-frame, and actuating mechanism, and means for transmitting motion from the actuating mechanism to said elongated frame and the cutter-frame respectively and for actuating the cutter.

770,289. AMALGAMATING MACHINE.—Frederick J. Hoyt, Chicago, Ill. The combination with a bowl mercury therein, a semi-submerged body floated in said mercury, held centrally in the vessel, but unsupported, at its axle ends, of a charging-spout over the body.

770,290. AMALGAMATING MACHINE. Frederick J. Hoyt, Chicago, Ill. The combination with an air-tube having an air-mover at one end and a nozzle at its other end, and a funnel under said nozzle of a bowl and a globe in said bowl semi-submerged in mercury.

770,376. MINE-DRILL.—George G. Lewis, Athens, Ohio. In a miner's drill, a post or upright frame comprising spaced side bars, upper and lower cross-pieces, points applied to said cross-pieces, a nut secured to the lower cross-piece and receiving the threaded portion of the lower point, a bevel-pinion loosely mounted upon the lower point and keyed to turn therewith, a bracket secured to one of the side bars and having a member receiving an end portion of the lower point and extended over the bevel-pinion, a shaft journaled to the other side bar, a bevel gear-wheel secured to said shaft and in mesh with the bevel-pinion, and a second bracket for receiving the outer end portion of the shaft and secured to the lower cross-piece of the post.

770,389. MANUFACTURE OF ALUMINUM.—Walter Rübel, Berlin, Germany, assignor of one-half to Nathan Bernstein, Berlin, Germany. The process consists in mixing clay with phosphate of calcium, sulphuric acid and a substance containing carbon, and heating the mixture to a bright cherry-red heat.

770,428. HEAT AND SMUDGE COMPOSITION.—Edward J, Griffiths, Los Angeles, Cal., assignor to George Griffiths, Los Angeles, Cal. An orchard-smudge composition comprising crude petroleum, sawdust or shavings, coal-screenings, and asphaltum containing sulphuric acid.

770,459. METHOD OF BLASTING.—Charles O. Frye, Joplin, Mo. The method consists in exploding a compression charge in proximity to the surface in which the blasting charge is embedded, with a body of air between it and said surface.

770,475. CONCRETE PILE.—George H. Poor, Chicago, Ill., assignor to Samuel Worthington McMunn, Chicago, Ill. A concrete pile consisting of a body portion of laterally-elongated form having a plurality of extensions projecting downwardly from its lower edge.

770,491. APPARATUS FOR THE CONTINUOUS FEEDING AND DISTRIBUTING OF MATERIAL IN GAS PRODUCERS, FURNACES, ETC.—Carl W. Bildt, Stockholm, Sweden. Apparatus for distributing ore, coal, peat, sawdust, bark, waste wood and the like in gas producers, furnaces and the like, the combination of a feeding-hopper, a rotary distributing-disk placed beneath the lower opening of the hopper, and one or more solitary pins or arms carried by the disk at a distance from its axis, said pins or arms having a sufficient length to cause the material that may be sticking or locked above the disk to fall down thereupon during its rotation.

770,498. MINE-CAR.—William E. Hamilton, Zanesville, Ohio, assignor to Hamilton Manufacturing Company, Columbus, Ohio, a corporation of Ohio. A mine-car comprising side and end walls, one of the walls having an opening therein adapted to receive a part of a loading-machine, and means on said wall normally projecting into said opening to engage said part to couple said car and loading-machine together.

770,503. PROCESS OF FORMING COAL BRIQUETTES.—Eli H. Larkin, St. Louis, Mo. The process consists in mixing approximately 3 per cent of crude petroleum with about 97 per cent of coal-slack, then adding starch paste in about the proportion of 2 pounds of starch in paste form to substantially 100 pounds of the petroleum-treated slack, and finally pressing the mixture into blocks.

770,545. HOISTING AND CONVEYING APPARATUS.—Yusuke Tamamura, Ashio, Japan. In combination, a rope-support, a rope having a fall pendent from the same, means whereby the running of the rope on opposite sides of the fall is detained and released, mechanism for actuating the rope in both directions and a counter-actuator operating upon said rope on each side of said fall.

770,554. PROCESS OF MANUFACTURING GAS.—Alfred Bougault, Paris, France, assignor to Société Francaise de Constructions Mecaniques (Anciens Etablissements Cail), Paris, France. The process consists in mixing gas-producer gas with atmospheric air, the proportion of such gas being in excess to that of the air, and then forcing the mixture into the solid fuel in a gas-producer at substantially the base of such solid fuel.

770,557. COMPOSITION OF MATTER FOR ARTIFICIAL STONE.—Courtland W. Brunson, Hamilton, Ohio. This composition consists of cinders, sand, barytes, cement, lime and water.

770,586. APPARATUS FOR MAKING TILES.—Gebhard Jaeger, Columbus, Ohio, assignor to The Hayden Automatic Block Machine Company, Columbus, Ohio a corporation of Ohio. This apparatus comprises a mold suspended for rotation, and means for automatically opening the mold and discharging the molded tile therefrom during the rotation of the mold.

770,607. JACK FOR MINING-MACHINES.—Matthew Raines, Decota, W. Va. A jack for mining-machines, comprising a pivoted adjustable jack-pipe, and means for locking the jack-pipe against pivotal motion with respect to the body of the jack.

770,624. GAS PRODUCER.—Walter O. Amsler, Pittsburg, Pa., assignor to The Emsler Engineering Company, Pittsburg, Pa. Combination, with the combustion-chamber, of a water-sealed trough below the combustion-chamber, a centrally-disposed cylindrical casing extending upwardly from the bottom of the trough, and a series of gratings supported by the cylindrical casing arranged in the form of a hollow frustum of a cone.

770,625. BRICK OR TILE CUTTER.—Byron E. Bechtel, Waterloo, Canada. A rotary cutting-reel comprising independent sliding approximately radial frames provided with cutting devices and with actuating-rollers, in combination with a traveling table engaging said rollers of the frames and thereby rotating the reel.

770,659. SEPARATION OF METALS FROM THEIR ORES.—Joseph B. Scammell, London, England. The process consists in bringing finely-ground ore suspended in water into contact with chloride of sulphur diluted from 200 to 400 times with oily matter whereby the metallic particles combine with the sulphochlorinated oil.

770,701. FURNACE FEEDER.—John Roger, Denver, Colo., assignor of one-half to Thomas Edwards, Ballarat, Victoria, Australia. A rod carrying a plurality of blades, a rock-arm, bell-crank levers carried by the rock-arm and operatively connected with the rod, a connecting-rod, and a connection between the connecting-rod and one of the arms of the bell-crank levers.

770,730. CARBORUNDO CEMENT.—Louis Emile Muller, dit Louis d'Emile Muller, Paris, France. A composition of matter in a pulverulent condition containing silicide of carbon, and a binding and hardening agent consisting of refractory clay, an alkali silicate and lime.

SPECIAL CORRESPONDENCE

San Francisco. Sept. 21.

(From Our Special Correspondent.)

The prospective reopening and extensive working of the old copper mines at Copperopolis, Calaveras county, in the lower foothills of the Sierra slope, is a matter of particular interest, both because of the historic interest of the old Union and Keystone mines at this place, and the importance of the industrial development involved. Actual preparations for the resumption of operations have now actively begun, and it is stated that the new reduction plant to be installed will probably be ready for production next spring. These operations follow about three years of active, but quiet, work in prospecting the property at depth, and in working out the most efficient plans for the conduct of operations. The future promises extensive operations in this once productive field, which in the present new era of the copper industry in California has been wholly eclipsed by the Shasta county field in northern California. This copper belt runs along the western slope of the range for about 400 miles, and many prospects have been opened throughout its length, a few being under development on a small scale at present, but in recent years production has been slight, Campo Seco, a few miles to the north of Copperopolis, being the scene of the most important work.

As the rainy season approaches active preparation for hydraulic mining goes on where this phase of the industry survives, and the federal engineers composing the California Debris Commission have been having an unusual number of applications for permits from the counties of the Sacramento and San Joaquin river water-sheds, where hydraulic mining is governed by the Caminetti law, and is conducted behind debris restraining dams. About 250 of the 665 licenses issued by the California Debris Commission are now in effect. There will be the usual activity throughout the drainage basin of the Klamath, in Northern California, where hydraulic mining is unrestricted.

Those concerned with gold dredging in this State are interested in the reported discovery of possibly valuable gold-dredging ground near Yuba City, Sutter county, on the Sacramento river. This is some distance below the Oroville field, on the Feather river. Prospecting has been begun at several points, including an old slough near Yuba City, in the bed of which profitable values are reported to have been found. Orchards flanking the slough are being prospected since the recent discovery of auriferous gravel under one of them, and it is likely that a number of keystone prospecting drills will be put into operation at various localities in this rich fruit and farming region.

Advices from Boston announce that the Eastern syndicate, comprising Albert F. Holden and others, which purchased the Mammoth copper mine in Shasta county some time ago, has decided to instal an extensive smelting plant at the mine. The men composing the company are also associated in the United States Mining Co., operating at Tintic and Bingham, Utah. The Mammoth is one of the large groups of claims on the Shasta county copper belt, in which very large reserves of low grade ore have been developed by extensive tunnels. It comprises 12 patented claims lying near the Sacramento river where it crosses the belt.

The Salamanca Gold Mining & Milling Co., holding the Bonanza, Blossom and Lucinda claims in the southeastern part of San Diego county, near Hedges, was recently made defendant in a suit for ejectment brought by W. H. Holmes and others, who alleged that the properties had been jumped by the defendant company. At the recent hearing the plaintiffs held that the erection of a cyanide plant satisfied the federal requirement of annual assesssment work. Superior Judge Torrance did not rule upon this point, but did rule that the extraction of gold from tailings could be counted assessment work. When the evidence of the defendant was concluded the case was dismissed upon motion of the plaintiffs, who will file another suit when they secure necessary evidence as to the original locations.

Denver. Sept. 24.

(From Our Special Correspondent.)

On September 19 Sheriff Edward Bell left Cripple Creek for Topeka, Kan., to interview Robert Romaine in regard to his confession, referred to in my previous correspondence. He intends to make a thorough investigation of all the particulars.

Thus far the lease system introduced at the Stratton's Independence mine seems to work successfully. It is understood that the first month's results showed a profit both to the lessees and to the company.

Within the past few days Mr. A. B. Frenzel, of this city, to whom the JOURNAL referred editorially in the issue of September 15 in connection with the making of ferro-vanadium from ores in the San Juan district, has brought out a new method for practically eliminating nearly all the silica in zinc concentrates. This is said to be the first time that this has been accomplished on a commercial scale.

The Independent Smelting & Refining Co. expects to blow in its plant at Golden, about 14 miles from here, within a short time. A circular letter has been addressed to the miners of the State, in view of the fact of the late cut in rates by their formidable opponents, the American Smelting & Refining Co. In this, after commenting on the action of the latter company in lowering its schedule of smelting charges in Gilpin and Clear Creek counties, the Independent company states that it will continue its present rates, and promises "permanently low living smelting rates, prompt and satisfactory settlements and courteous treatment."

Within the past few days about 1,400 men have been added to the working forces at the Minnequa plant of the Colorado Fuel & Iron Co. The converter plant had been closed down on account of a shortage of pig iron, while a great deal of repair work has been in progress at the rod mill. Within a few weeks the annual meeting of the stockholders of this company will be held here, and the financial reorganization plan considered.

A meeting of the board of directors of the Chamber of Commerce of Denver was held here recently, and offices were assigned in its building for the American Mining Congress.

Bids for the construction of the roadbed of the Denver, Northwestern & Pacific railroad, from Arrowhead to Hot Sulphur Springs in Middle Park, have been received.

Bisbee. Sept. 23.

(From Our Special Correspondent.)

A find has been made on the 1,250-ft. level from the Irish Mag shaft, in the Pride claim of the Calumet & Arizona mine, that is of much importance. It is a valuable orebody evidently, but it is another proof of the theory on which work has been proceeding in the camp for some time, that the bodies of oxidized lime and leached material found in such quantities in some of the properties are earlier ore. On the 950 and 1,050-ft. levels, through this same claim, drifts cut big bodies of this lime, but no ore; now a drift 200 ft. lower is in a large body of it, running high in copper. The Pride claim is sure to make a mine. In both Senator claims the same company is opening ore on drifts from the Oliver shaft, so that four of the six claims of Calumet & Arizona's central block of ground have been proved as ore-bearing.

Ore finds in Pittsburg & Duluth look very encouraging, and the statement has been made that there is a better showing than in any of the development companies of the Calumet & Arizona group, when they were combined into mining companies. Though this is not true, two orebodies have been shown, one by drill holes from No. 12 cross-cut and the other in the breast of No. 2, where iron pyrites has been improving in copper tenor till it now runs about 5 per cent and is growing better. The bonds on this property have been extended until late this year, and it is understood that conversion to a mining company takes place in November or December, and that the plan has been settled upon; it probably will be similar to that on which Calumet & Pittsburg was converted a year ago.

The conversion of Pittsburg & Duluth will leave only Junction as a low capitalized development company, and finds in the shaft with diamond drill indicate that it, too, is liable to be a mine. There yet remain $9 to be called of the original subscription price of $15 per share on this mine, and this will be called for slowly during the coming year. It is quite possible that Junction may never be converted, even if a mine is found, for it will not require the large sums that have been necessary in the case of each of the other companies.

Calumet & Bisbee has not been able to make arrangements for an extension of its bonds, and though it owns 50 acres in fee, is in a quandary as to the future. All its improvements are upon the ground held in fee. The company is busy and in hopes of finding ore later. It owes $85,000 on the Denn group of 212 acres, the major part of its land.

Butte. Sept. 20.

(From Our Special Correspondent.)

The find of copper-silver ore made a short while ago in the cross-cut run from the shaft on the 800-ft. level of the Reins Copper Co. is proving of more importance daily, and has the appearance of a strike of ore which will put the property on the list of producers. The drift is in some 40 ft. with 3 ft. of ore in the breast. The mine is on Main street, Meaderville, and was formerly known as the Betsey Dahl, now called the Combination. The claim is just east of the Piccolo, owned by the Boston & Montana.

Any number of lessees and tributers are mining in a small way in the silver belt of the camp. Many miners find that they can make better than wages operating on their own hook. The ores found in the silver belt are mostly highly silicious and are in good demand, and while they are generally low as to the silver content, most of them pay the producer a small profit. Six thousand tons of ore is the daily consumption at the Washoe works. Of this tonnage, 4,500 to 4,900 tons are first run through the concentrator. Since the completion of the big stack at the smelter, it is found that the daily capacity of some of the departments at the works is greatly increased. This throws other departments somewhat out of balance. In order to readjust the plant to conform with the new condition, both the briquetting and blast furnace departments will be enlarged.

Two new gold dredges are under construction in the State. The Conwey Placer Mining Co. is building one at Ruby, Madison county. This boat will be larger than any yet built by this company; it will use a 12 cu. ft. bucket. An English company, the Gold Creek Placer Mines, Ltd., Gold creek, Powell county, is building a bucket dredge which will be completed this fall. The company owns some 3,000 acres, the bed-rock on which is anywhere from 30 to 125 ft. deep. Besides this ground, the managemeent has secured options on the holdings of Kohrs & Bielenburg on the old Pioneer diggings, comprising 2,500 acres more. This latter ground is now being prospected with a Keystone driller and by sinking shafts to bed-rock.

Duluth. Sept. 25.

(From Our Special Correspondent.)

All railroads have had their ore schedules revised, and shipments are sure to be larger than was anticipated earlier in the season. Probabilities for Minnesota mines now are about 13,500,000 gross tons for the season, leaving only about 6,500,000 tons from Michigan and Wisconsin points to make up a total of 20,000,000, which is the outside estimate for all Lake Superior for this season. The overwhelming preponderance of Minnesota was never so clearly shown. In 1900 Minnesota first reached 50 per cent of total Lake shipments. Sales of ore are better and inquiry is rather brisk; it is a fact that Eastern interests have been unwilling to concede the fact that ore prices have been better for a month, but they have, and they are even now higher than quotations given at Cleveland. It is certain that unsold bessemers for this year's delivery are scarce, and any increased sudden demand, which may not come of course, would send the price still further upward.

Mesabi Range.—Stevenson mine has rounded 1,100,000 tons in its season's shipments and is making 100,000 tons output every week. But this exceptional speed will not be maintained to the close. Manager Shepard is making an enviable record, and is to be congratulated on the enormous business he has done this year, in the face of many difficulties, including a strike. The company's Jordan mine has closed for the year after a shipment of about 180,000 tons, its average annual business. This mine has been made to show an increased tonnage through recent development and now has a very considerable reserve of excellent ore.

At Fayal and Adams, spruce stocks are pretty well out of the way with No. 1 and 2 Fayal, and all but Vega of Adams cleaned up. No. 3 Fayal is still large, but a steam shovel is knocking it out daily. There were 196,000 tons in No. 2 pile. The weekly shipments have been increased of late in order to clean up this fall. Fayal shipments this year will be somewhat disappointing; the big open pit is idle most of the time, and interest has centered in underground development, in the sinking of No. 4 shaft, and stripping on the 2,000,000-yd. job let last winter. No. 4 is now down 200 ft. in rock all the way, and is being connected up with the other shafts. Work on a large steel shaft-house has begun. This will be one of the most complete on Lake Superior, but not so elaborate nor high as those at Ely, as the same work is not required of it. This shaft-house is to set on concrete foundations, the new standard. Fayal No. 3 pit has been active all summer, with a steam shovel at the bottom, but most of the work has been by hand, with mule tramming to the shaft.

Houghton. Sept. 25.

(From Our Special Correspondent.)

At the Phœnix mine operations during the past summer have been intermittent. This was because of an inadequate water supply with which to keep the concentrating department of the mill in operation. The water is secured from a dam built across the Eagle river, and scarcity of rains was responsible for the shortage. The mine is quite thoroughly opened, and while it was possible to keep the mill in operation a selection of copper rock could be forwarded which gave satisfactory returns. On account of the irregularity with which the mill worked, however, the summer's test has been a decidedly unfair one, and no conclusive opinion can be rendered concerning the earning possibilities of the mine. A serious obstacle in its way is the necessity of hauling the concentrates 12 miles to railroad connections for shipments to the smelter at Houghton.

The Mohawk has begun operations on a fifth shaft. This is located about 1,500 ft. south of No. 4 shaft, which has heretofore been the most southerly opening on the property. It is probable that this will represent the last shaft that the Mohawk will sink on its present holdings, since the remainder of the property south to the boundary line can be manipulated through No. 5. The drifts south from No. 4 are looking better as the distance increases from the shaft. The southern end of the Mohawk property probably contains its best values, and No. 5 shaft therefore gives promise of opening into ground better than the Mohawk average. It is in this direction that the Ahmeek property lies. The pit for opening No. 5 permanent shaft will be bottomed on the rock next week, through 18 ft. of overburden. A shaft lining composed largely of concrete will then be built from the rock to the surface of the ground. The completion of No. 5 shaft will entail the necessity of installing another stamp head in the mill at Gay, where three heads are now in operation. No. 4 shaft has just been completed and is now in full operation. The rockhouse is of steel throughout. A new 60-drill Rand air compressor was put into commission at No. 4 within the last six weeks. The hoist has a conical drum and is capable of sinking to a depth of 5,000 ft. No. 3 rockhouse, which was burned over a year ago, is being rebuilt and will be ready for service this fall. It is of wood, with corrugated iron sheathing. This shaft is still equipped with its temporary hoisting engine, which may be replaced next summer with a permanent conical drum hoist. No. 2 and No. 1 shafts are having their permanent hoists installed this fall, and they will be ready for service probably before the end of the year. They are somewhat smaller in capacity than No. 4 hoist.

At the Ahmeek mine a depth of 400 ft. in No. 1 shaft and a depth of 300 ft. in No. 2 shaft have been attained. No. 1 is the southerly and discovery shaft, and it opened an unusually rich amygdaloidal copper formation. Its high grade character has been maintained with depth. No. 2 shaft, 1,400 ft. north, penetrated a lower grade zone, but a decided improvement has recently taken place both in the bottom of the shaft and in the southern drift. The surface equipment is temporary throughout, and will remain so until next summer at least. The mine is shipping a variable quantity of rock, aggregating upward of 1,000 tons a week. ARTHUR L. CARNAHAN.

Salt Lake City. Sept. 23.

(From Our Special Correspondent.)

The smoke problem may prove to be a serious one for the companies having smelters in the Great Salt Lake valley. Fruit orchards and groves are in some cases reported destroyed. A number of damage suits have already been filed in the courts, the Utah Consolidated Mining Co. being named as defendant in a major portion of them. The farmers will hold another conference with the smelter men on October 10, when the latter will outline their plans for the future. In the meantime, the farmers have organized for a fight if a fight should be deemed necessary, and at a meeting on September 21 selected a number of committees, finance, legislative, legal, etc. It is proposed to ask the next legislature of the State to enact laws which will relieve the situation. It is believed the smelting companies will act promptly in the matter.

The August clean-up of the Consolidated Mercur mines aggregated about $65,000, the best month's record in a long time. President John Dern is authority for the statement that the net profits for the month were better than $12,000. The mill is doing good work again, and is running ore averaging better than $4 a ton.

The Annie Laurie mill in the Gold Mountain district will start up in a few days with its capacity enlarged one-half. Additional crushing and roasting facilities have been provided. The plant will take 300 tons of ore per day from the mine.

The Yampa Smelting Co., with a plant at Bingham, will shortly instal reverberatory furnaces and raise the capacity of the plant to 550 tons per day. Walter S. Kelley of Salt Lake is general manager.

Work is progressing satisfactorily with the construction of the new mill for the Stockton Gold Mining Co. at Stockton. It is expected that it will be ready for operation by November 1. The plant will have a daily capacity of 60 tons. J. J. Trenani of Salt Lake is manager.

Excavations for the new 100-ton mill for the Continental-Alta mine, in Little Cottonwood cañon, twenty miles from Salt Lake City, is progressing favorably. Henry M. Crowther, Salt Lake City, is manager.

The property of the Copper Mountain Mining & Milling Co., in Beaver county, has been redeemed, the judgments, aggregating $5,000, having been paid September 23, by Manager Ben T. Lloyd, of Salt Lake City. A reorganization of the company will follow.

The construction of the first 800-ton unit of the concentrator being built at Newhouse, Beaver county, by the Newhouse Mines & Smelters Corp, is being delayed somewhat by the slow arrival of structural steel. Fifty feet of the 150-ft. stack are completed.

Sudbury. Sept. 20.

(From Our Special Correspondent.)

More than one serious explosion has lately occurred at the new smelting plant of the International Nickel Co., at Copper Cliff; some of the men have been burned rather badly and are still laid up. The company has taken the pumps out of the old Copper Cliff mine. It is said that the cost of mining and raising the ore from the lower levels, about 1,200 ft. from the surface, was the cause for closing down, and a plentiful supply of ore, though not of such high grade, can be had more cheaply at the big Creighton mine.

After 20 years of preparatory and experimental work two properties are now being worked on the whole Sudbury nickel belt, the Creighton mine by the International Nickel Co., and the North Star mine by the Mond Nickel Co. The latter company, however, intends, apparently, to resume operations at the Victoria mine in Denison, as large contracts for wood and flux are being let this fall. Dr. Bernhard Mohr, the London manager, and Mr. Hiram W. Hixon, who had charge of the works from the start till about a year ago, are both expected to arrive in the district soon, the one on his usual annual visit, and the other to resume his old position.

The Lake Superior Power Co. is turning out steel rails and pulp on a moderate scale, and will soon have a rock drill at work on the Gertrude nickel mine.

The general opinion in the district is that the different industries of this unfortunate concern at Sault Ste. Marie will have to be put under separate management before even the best of them can have any chance of being made to pay. They would still be lying idle but for the aid received from both the Ontario and Dominion governments. It is a great change from the old days, when millions of dollars were being spent there every year.

Many local mine owners and others are likely to get up a good company before next spring, with a more equitable capitalization than has been the rule of late years, for the purpose of erecting a combined smelting and nickel refining plant somewhere in the Sudbury district, as there is no market for either nickel ore or matte at any price, and the demand for refined nickel has recently expanded very considerably in Europe, as shown by the exports of Canadian nickel from New York during the past year. Any amount of nickel ore of all grades is available for such a plant. The Thompson, or salt-cake process of refining nickel can be used, as the Canadian patent for it was allowed to lapse some years ago. Then the people of Ontario are very anxious to have the nickel refined in the country, and the Provincial government, and probably the Dominion government as well, would no doubt support so desirable an enterprise with a liberal bonus or in some other way.

Toronto. Sept. 24.

(From Our Special Correspondent.)

The Northern Iron & Steel Co. has been incorporated with a capital of $2,500,000, and head office at Toronto. The provisional directors are John A. Currie, Duncan Donald, Fred A. Hall and Wm. J. Lindsay, all of Toronto, and John T. Duguid, of Collingwood. The company was organized to take over the plant of the Cramp Steel Co., at Collingwood, the work having been undertaken by a committee representing the Canadian shareholders of the latter concern. John A. Currie is president and Duncan Donald secretary-treasurer. The plant of the Cramp Steel Co. will be turned over to the new corporation at once. It is understood that the board of directors will be strengthened by the election of two other gentlemen at a subsequent meeting, one of whom will represent the American shareholders, and the other, an experienced steel manufacturer, who will be in charge of the company's operations.

Judge Meredith on September 22 refused to grant an order compelling Judge Johnston, of Sault Ste. Marie, to state a special case in the action of Rowell & Mitchell against the Consolidated Lake Superior Co., so that the matter could be reviewed in a higher court. Judge Johnston, as referee in an arbitration, gave the claimants a verdict of $119,000 as damages for being dispossessed of the Helen iron mine, in the Michipicoten district, of which they were lessees. Judge Johnston's award is therefore sustained.

The visiting members of the British Institute of Civil Engineers, to the number of 125, arrived in Montreal on September 19. They were met by a deputation headed by Col. Anderson, president of the Canadian Society of Civil Engineers, and including numerous members of that body. A reception was given by the Canadian Society in its rooms on the evening of September 20, and the following day they were tendered a reception by the governors, principal and fellows of McGill University.

An extensive deposit of marl containing the constituents requisite for the manufacture of portland cement has been discovered near Winnipeg. The marl is near the surface, at varying depths of from 7 to 25 ft. in thickness. The marl has been analyzed by Prof. Kendrick, whose report is to the effect that it has the necessary ingredients for a high grade of portland cement. The area is 750 acres in extent and distant 12 miles from Winnipeg. T. O'Doherty, of Winnipeg, has endeavored to interest New York capitalists in the flotation of $500,000 in bonds, in order to enable the owners to erect a mill with a capacity of 1,000 bbl. daily.

The board of governors of the School of Mining at Kingston, Ont., has appointed Mr. A. McPhail professor of general engineering, and W. O. Tague lecturer in mechanical engineering. Mr. McPhail has recently been engaged in large engineering works near Boston. Mr. Tague is a graduate of the Massachusetts Institute of Technology and has recently been in the employ of the New York Shipbuilding Co.

Victoria. Sept. 20.

(*From Our Special Correspondent.*)

Lardeau.—Two compressor plants have been ordered for installation this autumn at Camborne, and the capacity of one of the local stamp mills is to be increased from 10 to 20 stamps. Besides the gold-quartz that will be milled at local stamp mills, production will be increased by shipments from two silver-lead mines, trails from which are being put in order to facilitate the rawhiding of the are as soon as sufficient snow shall fall. The Spokane Falls Placer Mining Co. has let a contract for the construction of a dam across Lardo creek, and 1,000 ft. of flume is also to be built. It is anticipated that placering will be started on the company's ground by the middle of October. Thos. E. Erehart, of Schenectady, N. Y., has assumed charge of the Lucky Boy mine and intends shortly resuming work on the property. It is stated that the mine produced, during the 12 months it was shipping, 250 tons of ore, averaging 250 oz. silver per ton and 30 per cent lead, which netted the company about $23,000. Announcement has been made that during the winter a stamp mill will be erected by the Great Northern mines, at Poplar creek, to treat the gold ores of the Lucky Jack and Swede group properties. On the Spyglass additional buildings are being erected to provide accommodation for more men, the intention being, now that the property has been purchased outright, to work a larger force the winter through. Developments continue to be satisfactory, and the claim is now regarded as one of the most promising in the camp.

Slocan.—Preliminaries are being arranged for the establishment of zinc-enriching works at Rosebery, on Slocan lake. A contract has been let for the erection of the buildings, which are to be completed within about four months. Part of the machinery has already been ordered from England, and the remainder is to be purchased in Canada and the United States. It is stated that a lead stack will be put in. The main supply of ore will come from the Monitor mine, at Three Forks, where the plant is to be added to and the working force increased to nearly 100 men. At the Reco mine, which in former years was one of the dividend-payers of the Slocan, new ore sheds and other buildings are to be erected at once, and more men are to be employed in the mine, which is reported to be looking well and promising a considerable production through the ensuing winter. On the Last Chance a winze has been sunk from No. 6 tunnel, and at about 200 ft. depth it encountered a large body of ore assaying 125 oz. silver per ton and 50 per cent lead. This orebody lies at a depth of about 1,700 ft. below the apex of the mountain, and its occurrence at that depth is considered to be very important to the mine and district.

East Kootenay.—Mr. G. G. S. Lindsey, of Toronto, who for some time past has taken a very active part in the business affairs of the Crow's Nest Pass Coal Co., has been appointed general manager of the company. Mr. Lindsey was already third vice-president, managing director and legal counsel to the company. Under the present system of management of the company's business each department has a distinct head. The mine operating department is under R. G. Drinnan, the sales and coke department under Mr. Pearson, and the accounting department under Mr. D. Davies. Contracts have been let for cutting a right-of-way for a tramway from the Sullivan mine to the railway at Kimberley. Operations are to be resumed at the mine, which is stated to have about 300,000 tons of ore in sight, as soon as the roasters at the new smelter, now approaching completion, shall be ready to receive it.

Monterey. Sept. 21.

(*From Our Special Correspondent.*)

The rains during the last two weeks have been very heavy throughout almost the entire Republic, and in Monterey there have been several days when the fall has amounted to 2.5 in. in the 24 hours. This has affected mining in many sections, not only by making the roads impassable, but also, in some cases, by practically flooding the mines. The rains at this time of the year are a very serious matter with many of the little inland smelters. They are frequently almost wholly dependent on the burro for their supplies, and this animal, after a long dry season, when he is insufficiently fed and weak, is caught in one of these cold rains, gets pneumonia and dies off in large numbers, thereby practically closing up transportation in these sections for a month or more. The latest and perhaps the smallest and crudest of these inland plants run by an American is that recently constructed by George McManus for treating his silver-lead ores at Cusihuiriachic, in Chihuahua, at the Santa Rosa mine, which is a circular furnace of adobe brick, 18 in. in diameter at the base and has a 3-ft. smelting column, to which blast is furnished by a No. 6 Sturtevant blower. It was built for experimental work only and will smelt about a ton and a half in 24 hours. Mr. McManus claims that when freight and treatment charges are taken into consideration, he makes a saving of over $50 (Mexican) per ton, and believes it capable of expansion up to a capacity of 10 tons a day, with a somewhat increased saving per ton. It is really the old Mexican smelter, and is worth experimenting on at isolated mines.

Many rumors are again afloat regarding the Refugio mine of Angel Garcia in Chihuahua, for which Wm. C. Beckman is now negotiating with the owner and two other parties, from both of whom he has offers, though not quite up to the $3,000,000 gold mark, which the owner asks.

London. Sept. 19.

(*From Our Special Correspondent.*)

Your readers will recollect that two years ago the Dunderland Iron Ore Co., Ltd., was formed by a number of British iron-masters, in conjunction with capitalists, to acquire and open up the deposit of iron ore at Dunderland, Norway. This ore cannot be used in its raw state, but will be crushed, electrically concentrated by the Edison process, and made into briquettes. As usual, the daily press made a nine-days' wonder of this new enterprise, so that many of your readers may be wondering how it is that so little has been heard of it since. The latest news will therefore be of interest. The time that has elapsed since the formation of the company has been occupied almost entirely in the construction of the railway from the mine to the sea and in building the harbor and wharves. The railway has been a difficult one to build, as it included a cutting 1,000 ft. long, and the sand and blue clay would not remain at the angle of repose which was calculated on, so that the cut had to be considerably widened. The buildings for the concentrating plant at the mines and for the briquetting plant at the harbor are being made very substantial, and their construction has been necessarily slow. The crushing, concentrating, and power plant is now in process of erection. It is expected that the railway and concentrating plant will be completed by the end of the year, and that the briquetting plant will be in operation some time during next summer. Up to March 31 last over £500,000 had been expended on construction work. It is estimated that the cash capital of £1,000,000 will not be sufficient for the whole of the work, owing to the unexpected difficulties met with in the building of the railway. In all probability another £200,000 will have to be found. During this time experiments on concentration and briquetting, especially the latter, have been continuous, and it is believed that the company will be able to turn out a briquette perfectly satisfactory to the iron-master. Of course, absolute certainty on this point cannot be guaranteed until the plant is in operation. Such eminent experts as Professor Henry Louis and Mr. J. E. Stead are confident that the briquetting problem has been solved, and many of the great iron-masters of England are actively engaged in the direction of the enterprise. Whether there will be any profit to the shareholders in the company also remains to be seen, but what the iron-masters are chiefly interested in is the new source of supply of their raw material to replace the Spanish mines, which are nearing exhaustion.

Perth. Aug. 15.

(*From Our Special Correspondent.*)

Kalgoorlie.—Sinking the main shaft below the 1,200-ft. level on the Golden Horseshoe has been resumed. The new milling plant is running well. At the Associated, high-grade ore is being exposed on the Iron Duke lode, in No. 1 southeast drive. Working costs at the Ivanhoe for July were further reduced to 20s. 9d. per ton. The east lode at the 1,014-ft. level is looking well; the last 200 ft. driven show ore of high average values. The new shaft at Hannan's Star is down 500 ft. Other development work is making good progress. Prospecting on the south side of the Hainault has opened up a fine orebody, seven ft. wide, of good paying ore, for a length of 200 ft. The first test parcel of ore taken from the lode at the 900-ft. level at the Boulder Deep Levels yielded 280 oz. of gold; the results of the second parcel were 236 oz. of gold off the plates and 73 oz. from concentrates from 405 tons. Further interesting evidence has been given before the commission inquiring into the matter of the alleged salting of the ore first struck in this mine. Mr. Zeb. Lane, one of the directors, stated that he believed some one working in the mine had acted in collusion with some one in London. One witness distinctly asserted that he arranged to share his profit on purchases of shares in consideration of information given him by one of the mine employees. It is seriously proposed to legislate to force the establishment of local boards of directors, in order to prevent these happenings in future.

A curious situation exists on the Boulder Perseverance. Mr. Nicholls, who had arranged to leave last week for London, still remains in charge, acting, it is said, on instructions from some one in authority in London. It is said that he has refused to hand over control to the new managers, Messrs. Bewick, Moreing & Co., until the company settles up with him.

The Cosmopolitan, at Kookynie, has further reduced its working cost to 13s. 4d. per ton. The Golden Pole, at Davyhurst, is now crushing steadily. The last clean-up yielded 788 oz. gold from 434 tons. The Valkyrie, at Norseman, has resumed work. The Princess Royal has cut the reef 200 ft. from the shaft, at the 500-ft. level, 4 ft. wide, and good milling ore has been found. July returns were 2,017 oz. of gold from 1,922 tons treated. The main shaft of the Princess Royal Central is down to 260 ft. Surface equipment is nearly complete.

Murchison.—The Great Fingall Consolidated's profits for July were £35,450, and the working costs 16s. 10d. per ton. A crushing of 130 tons from the New Alliance mine yielded 560 oz. 4 dwt. of smelted gold. The new tin find at Cuballing looks promising. A great number of leases are applied for. A local syndicate has been formed to bore and generally prospect over a large area of supposed oil and coal lands on the south coast, not far from the port of Esperance. A promising report has been made on it, and the necessary capital raised in Perth. The July gold yield was 192,306 oz., with a value of £682,688.

TO ENGINEERS VISITING NEW YORK.

A room for the exclusive use of visiting mining engineers is maintained at the New York office of the ENGINEERING AND MINING JOURNAL. Visitors to the metropolis are cordially invited to take advantage of the facilities it offers, by having their mail addressed in care of the JOURNAL, and making this office their headquarters. The managers of the branch offices will also be glad to welcome visiting engineers and to be of any service to them that they can.

TO ENGINEERS VISITING LONDON.

We are informed that the Institution of Mining and Metallurgy offers to all members of the American Institute of Mining Engineers nonresident in Great Britain the privilege of free use of the Institution offices and library in Salisbury House, London Wall, E. C. Visiting engineers may have their letters addressed to the offices of the Institution, and thus enjoy the advantages of temporary office accommodation in the city of London.

PERSONAL.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Mr. A. C. Beatty has returned to Denver.

Mr. Henry C. Banon is at Southsea, England.

Mr. E. Graham Price, of Kalgoorlie, is on a visit to England.

Mr. F. B. Richards, of M. A. Hanna & Co., Cleveland, is in Europe.

Mr. Henry M. Howe, of Columbia University, has returned from Europe.

Mr. J. H. Collins has recently purchased the Wheal Kitty mine, in Cornwall.

Mr. Francis J. Hubbard is examining mining properties at Jalisco, Mexico.

Mr. Chester P. Batchelder, of Spokane, Wash., is on a visit to New York City.

Mr. E. P. Mathers, proprietor of *South Africa*, is visiting the St. Louis Exposition.

Mr. W. R. Thomas, of Porth Towan, Cornwall, is examining mines in New South Wales.

Dr. R. L. Jack has been examining the Queensland Menzies mine in Western Australia.

Mr. Richard A. Parker has recently returned to Denver from a visit to Virginia City, Montana.

Mr. C. M. Schwab, of New York, has gone to California. He will return early in October.

Mr. Curtis L. Knight is suffering from a severe attack of typhoid fever at Salt Lake City, Utah.

Mr. W. F. Grace has left London to inspect mines in the northern territory of South Australia.

Mr. R. A. Varden, of Bainbridge, Seymour & Company, has returned to London from Siberia.

Mr. H. H. Armstead is in New York, having come here from professional work in West Virginia.

Capt. William Teague has been appointed lecturer at the School of Mines at Redruth, Cornwall.

Mr. William Yolen Williams has been examining mining properties near Ashcroft, British Columbia.

Mr. Miguel Otamendi, of Madrid, Spain, an electrical engineering expert, is now in this country.

Mr. H. L. Vivian is examining the Golden Calf group of copper mines, near Goode Springs, Utah.

Mr. Reginald Heath has been appointed foreman of the Bamberger-DeLamar mine at DeLamar, Nevada.

Mr. D. C. Jackling, general manager of the Utah Copper Co., has returned to Bingham, Utah, from the East.

Mr. J. A. L. Henderson, of Johannesburg, is in the Highlands of Scotland, recuperating from a serious illness.

Mr. Axel Sahlin, a member of the London firm of Julian Kennedy, Sahlin & Co., is now in this country.

Mr. J. B. Medina will take charge of a gold mining property at Mokelumne, Calaveras county, California.

Mr. J. W. Mercer returned last week to New York from California; he has now gone to Telluride, Colorado.

Mr. Grant Ford has accepted a position as electrical engineer with the Velardena Mining and Smelting Co., Mexico.

Dr. Henry M. Howe, professor of metallurgy at Columbia University, has returned from a year's absence abroad.

Mr. R. C. Canby, of Le Campañia Metallurgica Mexicana, returned on September 21 from a business trip in Europe.

Mr. Paul Ginther, manager of the Encinillas Mines, Ltd., at Santa Rosalia, Mex., has returned from a trip to England.

Mr. David Thompson, of Thompson & Co., mining engineers of Castlemaine, Victoria, Australia, is now in this country.

Mr. Willard F. Snyder, president and general manager of the Western Exploration Co., has returned to Salt Lake City from a trip to the East.

Mr. W. G. Sutherland, lately with the Golden Horseshoe mine at Kalgoorlie, is now on the metallurgical staff of the Fremantle smelter.

Mr. George W. Mabee, Sr., will take charge of the mining and milling plant of the Nicaragua Gold Mining & Milling Co., at Gracias o Dios, Nicaragua.

Mr. Daniel Ferguson, many years superintendent of the New York Bonanza mine, at Park City, Utah, has resigned, and will go to Tonopah, Nevada.

Mr. Edward L. Dufourcq is on his way to Sonora, Mex., on professional business. He expects to be in New York again about the beginnning of November.

Mr. Henry A. Mather, of New York, has returned from examining mines on Prince of Wales island, Alaska, and from a more recent journey to New Mexico.

Capt. Frank Oates, a director of De Beers, has been visiting Cornwall and advocating the necessity of more continuous work in the mines of his native county.

Mr. J. W. Rathbone, formerly connected with the Penn Steel Casting Co., has been appointed superintendent of the Birmingham Steel & Iron Co., Birmingham, Alabama.

Messrs. Redlich and von Enderes, the former one of the largest rock contractors in Austria, and the latter an Austrian mining engineer are visiting mining regions in Colorado.

Mr. Philip E. Lawrence, of Los Angeles, is examining properties in northern California. Mr. Lawrence will leave California in a few days for Chicago, returning in November via St. Louis.

Mr. Silas W. Eccles has been elected second vice-president of the American Smelting & Refining Co. in charge of the traffic department. Mr. Eccles has been traffic manager of the company for several years.

Mr. William A. Doble, president of the Abner Doble Co., of San Francisco, is a member of the International Jury of Awards, in the Department of Machinery, of the Louisiana Purchase Exposition.

Mr. J. Bruce Gibson, who has been the San Francisco agent of the American Smelting & Refining Co., at Oakland, Cal., will enter the employ of the Everett Pulp & Paper Co., of Washington.

Mr. Donald Gillies, who has been superintendent of the Pittsburg & Montana Copper Co.'s mines at Butte, Mont., has resigned to accept the management of the Montana Tonopah Mining Co., at Tonopah, Nevada.

Mr. Albert Ladd Colby, assistant to the president of the International Nickel Co., New York, has just returned to his office, thoroughly recovered from the attack of pleuro-pneumonia which he contracted in St. Louis last July while installing his company's exhibit in the Department of Mines and Metallurgy.

OBITUARY.

John F. Stairs, president of the Nova Scotia Steel & Coal Co., of Halifax, died at Toronto September 26, of pneumonia, aged 56 years. He was a director in many Canadian companies.

Ira Nelson Stanley died from cerebral hemorrhage at Freeport, L. I., September 21, aged 84 years. In 1861 he became associated with the late Joseph K. Brick in the manufacture of fire-brick and clay retorts used in the manufacture of gas, and was consulting engineer in the erection of a number of the largest gas plants in the United States. He invented the furnace for desulphurizing ore, and the Stedman-Stanley regenerative furnace.

Archer Brown, one of the founders of the firm of Rogers, Brown & Co., iron merchants, died at East Orange, N. J., September 23, of heart disease, aged 53 years. In 1880, in company with W. A. Rogers, he established in Cincinnati the firm which still bears their names. In 1895 Mr. Brown removed to this city to take care of its Eastern interests. The firm now has 14 offices here and abroad, and Mr. Brown only recently returned from a European trip to study the conditions of the foreign trade. He was an officer and director in many other concerns.

SOCIETIES AND TECHNICAL SCHOOLS

Engineers' Club of Philadelphia.—A meeting of this club will be held October 1. Mr. Washington Devereaux will read a paper on 'Some Causes of Fires.'

Syracuse University.—Lyman C. Smith, founder of the Lyman Cornelius Smith College of Applied Science at this university, has given an additional $100,000 for the erection of a model factory building for a mining, engineering and mechanical laboratory.

Western Association of Technical Chemists and Metallurgists.—This society is sending out ballots to its members to be used for the election of a board of governors. The secretary, Mr. H. C. Parmelee, reports the progress of the society's work as very satisfactory.

Engineers' Society of Western Pennsylvania.—A meeting of this society was held at Pittsburg, September 20. Gerald E. Flanagan read an interesting paper on the power plant installation of the Phipps Power Building, Pittsburg. A meeting of the structural section of the society was held on September 27, and on October 11 the mechanical section will meet to discuss a paper by R. N. Ehrhart on 'The Steam Turbine.'

TRADE CATALOGUES.

The filter presses for the treatment of gold ores and gold ore slimes made by William R. Perrin & Co., of Chicago, are described in a pamphlet recently issued by them.

The Kimplen Crusher & Pulverizer Co., of Chicago, has issued two attractive illustrated booklets devoted respectively to the Kimplen crusher and the Kimplen pulverizer.

The Wellman-Seaver-Morgan Co., of Cleveland, Ohio, has prepared a handsomely illustrated description of the Sargent complete expansion gas engine, which it manufactures.

From George G. Blackwell, Sons & Co., Ltd., of Liverpool, Eng., manufacturers of ingots and castings, and dealers in steel alloys, we have received half a dozen compact little books describing their plants and products.

One of the chief difficulties of the sportsman, the question where to go and when to go, is solved by the publication of the booklet 'Fishing and Shooting,' by the Canadian Pacific railway. It gives an account of the sporting regions of the Dominion of Canada, tells what each can offer, how it may be reached and what facilities in the way of accommodation, guides, canoes and outfits, etc., are to be procured. It is an eminently practical little work, compiled by men who have been there themselves and know what they are talking about. An appendix containing a synopsis of the game laws of the Provinces and States touched upon is issued as a separate publication. The booklet can be had free of the nearest C. P. R. agent or of the advertising agent of the Canadian Pacific railway.

INDUSTRIAL.

C. Harzer & Co. state that they have removed to more convenient offices, and that on and after September 20 next their address will be Finsbury Pavement House, London, E. C.

The Fort Wayne Iron & Steel Co., of Fort Wayne, Ind., is building an addition which will increase its capacity about 15 tons per day. The company manufactures bar and band iron and has an annual capacity of 50,000 tons.

The Chattanooga Furnace Co., of Chattanooga, Tenn., which recently went into bankruptcy, will be reorganized, and in the place of the old furnace now situated on the western base of Cameron hill a new stack will be erected. The new furnace will have a capacity of 125 tons per day.

The bessemer plant of the American Steel & Wire Co. at the Newburg, Cleveland, Ohio, works has resumed operations. The converters are now the largest in use in this country. One of the Central blast furnaces of this company at Cleveland has resumed. The other two stacks are being rebuilt.

It is reported that the Niles-Bement-Pond Co., at Hamilton, O., proposes to build a $150,000 addition, if room can be secured. There is a possible project to consolidate, to a greater or less extent, the Ohio and New Jersey plants in the latter State, and a total abandonment of the former plant may result.

The Kosaka mines, one of the most extensive copper properties in Japan, are to be installed with considerable American hydro-electric equipment. An 850-h.p. Leffel water turbine, to operate on a 104-ft. head, and to be directly connected to a general electric generator, is among the machinery ordered.

The Taylor-Wilson Manufacturing Co., of Pittsburg, has been incorporated with a capital of $25,000. It will take over the business of Taylor, Wilson & Co., Ltd., Allegheny, Pa., manufacturers of machine-welded gears and other machinery. The Taylor-Wilson Co. is building a large new plant at McKee's Rocks, Pittsburg.

The Westinghouse Electric & Machine Co., on September 19, entertained a party of the delegates to the congress of electrical engineers with a banquet at its works at East Pittsburg, Pa. Four hundred guests were present, including electrical engineers from all parts of the world. Mr. George Westinghouse presided.

The Soho furnace of the Jones & Laughlin Steel Co., of Pittsburg, has been blown in after a long idleness. A new blowing engine house has been built and new engines installed. No. 3 furnace of the Eliza group, after having been banked for several weeks, is again operating, and furnace No. 2 will be blown out in the near future for relining.

The Colorado Iron Works Co. of Denver, Colo., through its representative, W. R. Grant, has sold to the Detroit Copper Co., at Morenci, Ariz., six sets of 40 in. by 16 in. improved standard wide-faced crushing rolls. The weight of these rolls, ready for shipment, is about 80 tons. This is one of the largest rolls orders lately placed in the southwest.

The United States Malleable Iron Co.'s new plant at Toledo, O., is about completed, and it is expected that it will be in operation early this month. The main building is 400 ft. long, with two wings. The officers of the company are: President, Robert C. Pew; vice-president, Pressley T. Craig; secretary, W. H. Jeffrey; treasurer, D. C. Hagener.

The E. I. Du Pont de Nemours Powder Co., a consolidation of numerous allied plants, has acquired control of the Chattanooga Powder Co., at Ooltewah, Tenn., and is negotiating for the Eastern Dynamite Co. Each share Eastern company is entitled to $320.87 preferred and $443.64 common stock of the E. I. Du Pont de Nemours Co., and $15.82 in cash. This offer expires October 1, 1904, and to depositors before that date dividends from July 25, 1904, are promised on the preferred stock.

The Wile Power Gas Co., of Rochester, N. Y., has recently been organized to manufacture automatic gas producers with a patent regulator of the pressure type. The producers will work with either coke, charcoal, anthracite, bituminous coal or with wood. The company will also build suction gas producers, designed by experienced gas engineers, and embodying the best features of European practice. Julius I. Wile, previously in charge of the engineering and sales department of the Fraser & Chalmers Co., Ltd., London, is manager of the company.

At a meeting of the newly-elected directors of the American Smelting & Refining Co., held September 19, the board organized by the re-election of all retiring officers and by the election of Silas W. Eccles as vice-president in charge of the traffic department. This office is newly created. Mr. Eccles has been the traffic manager of the company for the past two or three years. The board also declared the regular quarterly dividend of 1.75 per cent on the preferred stock, payable October 11, and also the regular quarterly dividend of 1.25 per cent on the common stock, payable October 25.

The Crawford & McCrimmon Co., of Brazil, Ind., reports recent sales of ventilating fans for mines as follows: Beacon Coal & Coke Co., Philadelphia, Pa., one 16-ft. fan and engine; Wabash Coal Co., Cleveland, O., one 12-ft. fan and engine; Tutwiler Coal, Coke & Iron Co., Birmingham, Ala., one 20-ft. fan and engine; Denny Clay Co., Seattle, Wash., one 12-ft. fan and engine; Royal Coal Co., Madisonville, Ky., one 16-ft. fan and engine; W. A. Gosline & Co., Toledo, O., one 16-ft. fan and engine; S. H. Wulfmann Coal Co., Huntingburg, Ind., one 16-ft. fan and engine; Black Diamond Coal Co., Auburn, Ill., one 16-ft. fan and engine; Reeves Coal Co., Canal Dover, O., one 16-ft. fan and engine; Tennessee Coal Co., Briceville, Tenn., one 16-ft. fan and engine; Reliance Coal & Mining Co., Chicago, Ill., one 16-ft. fan and engine; Saxman Coal & Coke Co., Latrobe, Pa., one 20-ft. fan and engine; Greenwich Coal & Coke Co., Latrobe, Pa., one 20-ft. fan and engine; Pine Run Coal Co., Leechburg, Pa., one 12-ft. fan and engine; Pioneer Coal Co., Philadelphia, Pa., one 12-ft. fan and engine.

GENERAL MINING NEWS.

Oil Exports.—The United States exported in August, 10,805,583 gal. crude oil; 2,176,386 gal. naphthas; 65,640,774 gal. illuminating; 5,682,545 gal. lubricating and paraffin; 213,864 gal. residuum; total, 84,519,152 gal., as against 77,688,035 gal. in August, 1903. For the eight months ending August 31 the exports of mineral oils totaled 643,838,523 gal., which is 67,071,550 gal. or 10.4 per cent more than was reported in the corresponding period last year. The more important consumers were Germany, Great Britain, France and Japan.

ARIZONA.

COCHISE COUNTY.

Benson.—The new smelter at this place is ready to begin operations. There are indications that ore will be abundant.

Calumet & Arizona.—Ore has been cut by the Irish Mag shaft, on the 1,200 ft. level of this company's property at Bisbee.

Calumet & Pittsburg.—At this mine the pumps have drained the lower workings. Sinking is in progress at the bottom of the shaft.

Pittsburg & Duluth Development Co.—An important find of copper is reported in the shaft of this company's mine, at Bisbee. A vertical drill hole is said to be down 60 ft. in sulphide ore.

Tombstone Consolidated Mining Co.—Work on this company's property at Tombstone is going forward steadily. Sinking on the main shaft has been resumed.

GRAHAM COUNTY.

Federal Mining Co.—This company will erect a 100-ton smelting plant on its property near Safford. It is operating the San Juan mine.

Home Copper Co.—The tunnel in this company's Sullivan mine is now in 300 ft. A body of low-grade free milling ore has been encountered.

Michigan-Arizona Mining Co.—This company has been organized to operate mines in the Graham mountains, near Safford.

Sierra de Oro.—A good strike is reported at this mine near Clifton.

YAVAPAI COUNTY.

United Verde.—It is reported that the fire that has been burning in these mines at Jerome for five years has been subdued, and that extensive improvements have been made.

Valverde.—The smelter on the property, 20 miles east of Prescott, was totally destroyed by an explosion of molten slag September 20. The plant cost $175,000.

Yavapai Gold Mining Co.—It is reported that a good body of ore has been opened at this company's mine, near Mayer.

ARKANSAS.

SEVIER COUNTY.

Gillham.—A rich deposit of antimony is reported to have been discovered at this place.

CALIFORNIA.

AMADOR COUNTY.

Amador Queen No. 1.—This mine, with the neighboring Amador gold mine, belonging to the estate of Charles W. Trotter, now in probate in Amador county, is appraised at $9,000, and a petition for its sale will be heard October 22.

Bay State.—This mine has resumed operations after an idleness of several years.

South Eureka.—The work of erecting the new 20-stamp mill, which is independent of the old mill, has been actively begun by Superintendent B. B. Haven.

Whitmore.—This mine, at Volcano, has been leased by A. B. McLaughlin and others, of Volcano, and will be operated.

Wildman-Mahoney.—The miners employed at this mine have received five months' pay on account. Through faith in the mine and in Superintendent John Ross, a force of local miners worked at development for a year without pay.

CALAVERAS COUNTY.

Fred Grove.—This property, near West Point, is being equipped with a hoisting plant. In this district the Riverside is soon to resume, and several prospects are under development.

Lone Star.—This mine, at West Point, in the east belt, has resumed operations after a year of idleness. It is owned by the Farmington Gold Mining Co., Mark D. Newell, superintendent.

Melones.—Forty stamps are soon to be added to the 60-stamp mill at this mine.

Royal.—The pumps at this mine have been repaired and work is to be resumed.

EL DORADO COUNTY.

Channel Bend.—At this extensive placer property, on the American river, recently bought by the Eagle Bar Placer Mining Co., a crib dam is being constructed. It is reported that a gold dredge is also contemplated by the company.

Landecker.—The Landecker Mining Co., which recently bought this property, has placed the foundations for a new mill and added new buildings to the surface plant.

Pyramid.—At this mine, near Dry Creek, ore is being stoped from the 400-ft. level, and a contract has been let to sink the shaft 100 ft.

Short Handle.—It is reported that after several years of idleness work is to be resumed at this mine, near Spanish Dry Diggings.

INYO COUNTY.

Radcliff.—This mine, at Ballarat, is to be re-opened upon Superintendent W. W. Godsmark's return from New York. Mr. Godsmark will use a roasting process which he has adapted to the base ores of the mine.

Republican.—At this Ballarat mine George Montgomery is installing a new 60-h. p. boiler plant and will increase the milling plant as a result of recent developments.

KERN COUNTY.

Paris.—At this camp several properties are active. H. H. Blood, owner of the Zada mine, states that a mill is to be erected. Valuable ore has been developed. The Amalie is steadily producing. The Dora is under development, with good prospects.

MARIPOSA COUNTY.

Mt. Gaines.—This mine, near Hornitos, has been sold to the Consolidated Mining & Promoting Co., of Los Angeles, which will resume development. The mine was closed four years ago, after development to the 300-ft. level.

Sweetwater.—A 10-stamp mill, compressor, etc., to replace the old 5-stamp mill, have been shipped to this mine, near Jerseydale. There is a 1,600-ft. tunnel, and the mine has been idle some time. L. E. Hanchett, of San Francisco, is the owner.

White Rock.—This copper mine, near La Grande, is being reopened for further development by Superintendent Charles E. Hill. Some high-grade ore will be shipped. A small reduction plant is contemplated. The prospect is owned by people from Boston and Ellsworth, Me.

NEVADA COUNTY.

Grizzly.—A new compressor is about to be installed at this mine. The new 10-stamp mill will soon be completed.

North Star.—Extensive repairs are to be made to the mill at this mine.

PLACER COUNTY.

Bonnie Bee.—It is reported that San Francisco people are negotiating for this mine, near Towle, with active operations in view. J. L. Waggoner is superintendent.

PLUMAS COUNTY.

Blue Gravel.—At this drift mine, on the North Fork of the Feather river, the tunnel being driven to the channel has reached 1,300 ft. and is rapidly progressing. John Brincefield, of Hanford, Cal., and others are the owners.

SISKIYOU COUNTY.

Blue Ledge.—At this copper mine, on Siskiyou mountain, Superintendent C. W. Geddes will continue development through the winter, though isolated by snow. The mine is being developed under bond by New York people.

Drummer Boy.—At this mine a mill will be erected. This was one of the earliest quartz mines to be opened in Siskiyou county, and in the early days it was worked by an arrasta, but it received only superficial development until recently.

Mt. Vernon.—At this mine, at the head of Greenhorn creek, a new 10-stamp mill will be ready for operation in a few weeks, and several buildings will be added to the surface plant. The company owning this property has bonded the Ohm & Hahn claim, in this district, and is driving a tunnel.

TRINITY COUNTY.

California Surety.—A body of high-grade ore is reported to have been found in this mine, near Carville. Hugh Hume is superintendent.

Dorleska.—An electric generating plant will be installed at this mine to furnish power and light to mine and mill.

Trophy.—This placer mine, on Willow creek, has been bought by Oliver L. Roberts, who has also secured extensive placer ground on the Trinity river, in that region, from Charles B. Newell.

Yellow Rose.—A cyanide plant is to be added to the plant of this mine. J. C. Boddeker is superintendent.

TULARE COUNTY.

Ada Jewell.—A Huntington mill, gasoline engine and other milling equipment have been shipped to this mine, at Fountain Springs. Frank Marshall, of Porterville, and others are owners.

TUOLUMNE COUNTY.

Golden Gate.—It is reported that this mine is to be reopened by a syndicate which has secured a bond.

COLORADO.

BOULDER COUNTY.

Great Western Exploration Co.—This company is developing wolfram and tungsten properties near the old camp of Nederland. A carload of concentrates is being shipped weekly.

CHAFFEE COUNTY.

Hematite.—Reports of good strikes continue to arrive from this new field. Some ore taken is said to average $60 to the ton and to contain 7 per cent copper. The camp is about 10 miles northeast of Salida.

CLEAR CREEK COUNTY.

Bertha.—An addition is to be built to the mill at this mine at Idaho Springs.

McClelland.—Work has been resumed on the breast of the tunnel of this mine at Idaho Springs after an idleness of several weeks, caused by a heavy flow of water.

Ninety-four.—Repairs to the mill at this mine at Alice have been completed, and it is now treating the ore that had accumulated in the bins.

Oldtown.—Owing to the action of the water in rapidly destroying the metal pipes at this mine at Idaho Springs, pipe which is lined with wood has been substituted. A five-car lot of ore was shipped recently to the Golden smelter.

Stevens.—An electric power line has been constructed to the mill at this mine at Silver Plume.

CUSTER COUNTY.

California.—This lode near Custer has been sold to the Globe Gold Mining Co., of Colorado Springs. It is reported that the same company will purchase the Nellie mine near this property.

Custer County Gold Mining Co.—Development continues steadily at the Toledo mine of this company at Custer.

Evening Star.—A strike of high-grade hessite is reported at this mine at Custer.

EL PASO COUNTY.

General Metals Co.—A petition in bankruptcy against this New York company has been filed by creditors. Alfred Roelker, Jr., has been appointed receiver of the assets, which, it is stated, consist of the large plant, machinery and factory property, valued at $500,000. The company was incorporated on August 23, 1903, with an authorized capital stock of $1,500,000, of which $900,000 is outstanding. Charles E. Finney was president, John A. Hannan, vice-president, and Henry B. Haigh, treasurer. Labor troubles are said to have caused the failure of the company. The liabilities are $350,000 and the nominal assets about $500,000.

GILPIN COUNTY.

(*From Our Special Correspondent.*)

Smelter Rates.—The Independent Smelting & Refining Co., operating the Golden smelter, which is dependent on the ores of Gilpin and Clear Creek counties for its capacity of 300 tons per day, has made rates, including freight on low-grade smelting ores, from $5 and up per ton, and on silicious ores from $6 and up per ton, including freight, with a satisfactory rate for tailings and concentrates. The American Smelting & Refining Co. claims that, as it wants dry copper and iron ores of these counties, it will make prices of $4.75 per ton for ores carrying values of less than $11 per ton and $6 on ores carrying values of up to $18 per ton, which are the grades of ores which would be most likely to go to the Golden smelter. There is no doubt of a fight being on, and the mining men will have the advantage as long as it lasts. Indications are that a good deal of the better grade of milling ores will be sent to the smelters in preference to the stamp mills in the future.

Arizona.—Cleveland and Boston parties are interested in this property at the head of Elkhorn gulch, where some extra good ore has been opened up at a depth of 500 ft., which carries assay values of over $800 to the ton, principally in gold. C. Morgan, of Idaho Springs, is manager.

Buckley & Woods.—These properties have been taken under an option by Chicago parties and operations have been begun. The product is of a low grade, but inasmuch as there are large bodies it is believed that it will be made to pay a profit if handled on a large scale. John Laughran, Central City, Colo., is manager.

Clear Creek Mining & Reduction Co.—The Gaston Mine Co. has conveyed to this company the Gaston group, in Russell district, for a consolidation of $120,000; the Saratoga & Cyclops Gold & Silver Consolidated Mining Co. to the same company, the Saratoga group in Russell district, and the Cyclops group in Enterprise district, for a consideration of $280,000, the entire consideration being $400,000.

Coronado.—Press reports state that a strike of remarkable magnitude has been made at this property. The new orebody is said to be 1,500 ft. long, 400 ft. wide, 200 ft. thick, and sulphide in character. The Western Mining Co. is operating the property.

Hall.—Nebraska parties have this property in Russell district under a lease and bond. A new hoisting plant has been installed, as heavy developments are planned. Smelting ores running up to $200 per ton, and milling ores ranging between two and six oz. gold per cord have been taken out. George N. Rogers, Black Hawk, Colo., is superintendent.

Hampton Consolidated Mining Co.—Development work is being kept up at the Hampton property of this company in lower Russell district. It is the intention of the company to install a steam plant and erect new top buildings. N. I. Hughes, Central City, Colo., is manager.

Katheryn.—Eastern and Denver parties are interested in this tunnel property in the Pleasant valley district. A compressor and electric plant may be installed. E. H. Roberts, Black Hawk, Colo., is manager.

Minnesota Gold Mining & Milling Co.—Eastern parties have become interested in this company, operating in the Central City district. The incorporators are O. L. Beardsley, Walter Gregory and A. S. Lamberton.

Procunier.—A two-years' lease and bond in the sum of $25,000 have been taken by Eastern parties on this property in the Hawkeye district, six miles north of Central City. The shaft is to be sunk 100 feet.

Pyrenees-Nimrod Mines Corp.—Minneapolis and Colorado parties have become interested in this group in the Russell district, and they incorporated with a capital stock of $200,000, with the following officers: President, E. B. Wilson, Minneapolis, Minn.; vice-president, F. F. Reed; secretary, L. E. Tobias; treasurer and general manager, John Moynahan, of Idaho Springs. Work is being carried on in the 600-ft. shaft of the Nimrod at present. A new plant of machinery is to be installed on the 800-ft. shaft of the Pyrenees, and the main work in the group will be carried on from that shaft.

LAKE COUNTY—LEADVILLE.

(*From Our Special Correspondent.*)

Bessie Wilgus.—The shaft on this property has been started and is being pushed. The ground adjoins the Reindeer. At the Iron mine John Murphy and P. Muloch are sinking shafts on the hill near the Reindeer.

Reindeer.—John F. and George Campion last June secured a lease on 37 acres of the Wells-Moyer placer on Rock Hill belonging to the Iron Silver Mining Co., and in July started a shaft about 600 ft. south of the old Sequin shaft. In 63 days the shaft reached the 500-ft. mark; levels were started at the 400, 450 and 500 ft. points, and reached the orebody at about 100 ft. from the shaft. To date, the ore channel has been opened for 1,100 ft. and 500 ft. east and west, and 600 ft. northeast and southwest, and the average thickness is 150 ft. The ore is a hard carbonate, and its net value is $20 per ton. None of the ore is sorted, but is sent direct to the smelter as it is broken in the mine. One hundred tons a day are being shipped. A drift was started from the shaft and driven 250 ft. south, and it caught the old Crown Point oreshoot. It has been opened up for over 30 ft., and the ore is a hard carbonate running well in silver and lead. Work will be continued until the extent of the ore-channel is ascertained. When the Campions first struck the ore in the Reindeer they secured 67 acres more ground, giving them in all 100 acres. This is the most important strike that has been made in the district since the opening of the Little Johnny mine, Breece Hill, in 1892.

Big Six.—This mine on the lower portion of Evan's gulch is showing a fine grade of ore. At present the body is small as the main ore shoot has not been reached, but it is expected in a few weeks to tap the main ore-channel. Should this be realized it will prove that the Fryer Hill oreshoots trend to the west.

Ibex.—The lessees of this property are shipping 1,500 tons per month of a very good grade of ore, mostly silicious. No. 4 shaft has been let out on lease down to the lower level, 1,300 ft.

Sunday.—This mine on Ball Mountain, at the head of California gulch, is shipping steadily a good grade of ore, the values all being in gold. In the same neighborhood the Elva Elma is also shipping good ore. The district is coming rapidly to the front. All of the veins are fissures, small but rich, and all of the ores have to be sorted.

LAS ANIMAS COUNTY.

Butterfly-Terrible.—The receipts for the first two weeks in bullion and concentrates from the Butterfly-Terrible mill, at Trinidad, in September, are said to have run over the $5,000 mark, and the daily tonnage is being gradually increased.

OURAY COUNTY.

Camp Bird.—According to the report of working operations at this mine at Ouray, for the quarter ending July 31, the results during that period were very satisfactory. Foundations for the additions to the battery and concentrating plant are nearly completed, and the addition to the cyanide mill is finished. A new orebody has been intersected by a prolongation of the Chicago tunnel, which was advanced 62 feet during the quarter.

PARK COUNTY.

Hayman Mining & Tunnel Co.—Considerable machinery is purchased for this company's mine at Hayman in the Tarryall mining district. Frank Clancy is general manager.

Taxco Mining & Milling Co.—A judgment for $53,567 and a decree ordering foreclosure have been granted to David H. Moffat by the District Court against this company.

SAN JUAN COUNTY.

Green Mountain.—A good ore-shoot is reported to have been encountered in this old mine at Silverton.

Treasury Tunnel Mining & Reduction Co.—A stamp mill is to be erected at this company's mine at Red Mountain. Its capacity will be 30 to 50 tons, with the possibility of increase to 100 tons daily.

SUMMIT COUNTY.

Brune, Milo and Arnold.—These sulphide properties, on Elk mountain, are showing favorably.

Mayflower.—This mine, at Kokomo, has been leased to George Pomeroy.

Silver King.—This lode and dry placer, on Nigger hill, at Breckenridge, has been leased to R. J. A. Widmar.

Thompson Mining & Milling Co.—This company is putting in a new air-pipe and building a furnace at the mouth of the shaft at its property, near Kokomo.

TELLER COUNTY—CRIPPLE CREEK.

(*From Our Special Correspondent.*)

Old Gold.—This property, on Beacon Hill, has been leased to A. H. Roller and associates, and possession has been taken by the new operators. For some time the property has been worked by the company, and a considerable amount of improvements put in. Previous to the working by the company it was operated under lease by E. G. Taylor, of the C. K. & N. company. While only a comparatively new shipper, it has produced a considerable amount of rich ore.

Pharmacist Consolidated Gold Mining Co.—A new lease has been given on this company's property, and it is understood that after a few weeks' prospecting the work of sinking the shaft to a further depth of 150 ft. will be begun. The property has not been doing much during the past year, but now it is hoped that it will take a new lease of life.

Strong Gold Mining Co.—Sinking for another lift has begun on this property, which when completed will make the shaft about 1,100 ft. deep. The property is shipping a fair amount of good grade ore. It is a close corporation, and the stock is held principally by Colorado Springs men.

IDAHO.

ELMORE COUNTY.

Monarch.—At this mine, at Atlanta, surveys are being made for a 2,500-ft. tunnel. It is proposed to remodel the mill and make other extensive improvements in the spring. Daniel Kirby is manager.

IDAHO COUNTY.

Lucky Lad, Liberty Bell and Buffalo Lake.—A consolidation of these camps and the erection of a smelter at a convenient point is said to be contemplated.

Concord.—A new shaft at this mine, at Hump, is now 100 ft. down. It is equipped with a steam hoist.

Big Buffalo.—The tunnel at this mine, at Hump, is said to be in nearly 1,000 ft.

NEZ PERCES COUNTY.

Ohadi.—A test shipment of 1,000 lb. has been made from this property, in the Cave Gulch district. Machinery will be installed during the winter. J. M. Edwards is manager.

SHOSHONE COUNTY.

Hunter.—The mill at this mine, at Mullan, has been overhauled and new and improved machinery installed. W. A. Bradley is in charge.

WASHINGTON COUNTY.

Iron Springs Mining Co.—A 200-ton cyanide plant has been purchased for this company's property, in the Rapid River district.

MICHIGAN.

HOUGHTON COUNTY—COPPER.

(*From Our Special Correspondent.*)

Centennial.—No move has been made to alter more than the one head now in commission. The mine is not prepared to supply rock for more than one head, and therefore it is not a matter of immediate importance. One-fifth of the rock that is being treated comes from the stockpiles. A pair of crushing rolls has been ordered from the Nordberg Manufacturing Co. of Milwaukee.

Champion.—In order to encourage its employees to build houses on its mine and mill locations, this company is offering favorable inducements in the way of inexpensive leases and donations. Land is rented at a nominal charge and the company will give $100 towards the erection of the first 20 dwellings costing $750 each, or proportionate amounts for cheaper houses.

Osceola Consolidated.—The mineral yield of this mine is decidedly better than last year, when conditions did not permit a favorable rock selection, especially at the North and Kearsarge branches. The yield from the old Osceola lode last year was fully as good as that secured from the Kearsarge lode openings; but not so now, as the South Kearsarge is going a trifle over 20 lb., and the North Kearsarge nearly that.

Quincy.—Work on the red sandstone mineral storehouse at the smelting plant at Ripley is completed. The structure is 40 by 95 ft. The pressed steel cars will be delivered in a few days. As soon as they are delivered the mineral house will be used and the shipping of mineral in barrels will be discontinued. A fifth furnace is being constructed. It will be larger than any of the others and will have a capacity of 40,000 lb. of mineral per day. It is being erected in the open air, but work on the foundation for a brick building which will enclose it will be started at once. Numerous mechanical changes have been made at the plant lately and the handling of the product has been greatly simplified, and operating costs lessened.

Trimountain.—Development work at this property is progressing rapidly. The drifts are penetrating good ground. Production has shown a decrease for each successive month since June, but this is without significance, and the output for the remaining months of the year should be larger. The rock is returning 21 lb. of refined copper per ton. That coming from the lower levels is as rich, if not richer, than that from the older workings. The values have been demonstrated to a depth of 600 ft. below the bottom of the lowest openings by the use of a diamond drill; 65 drills are in commission.

Winona.—At the sixth, or bottom, level of this mine the showing is better than at any point in the levels above. Should all of the unexplored ground extending a quarter of a mile to the south of No. 3 shaft prove as good as that already opened the property will make a good-sized mine. The fourth level south of No. 3 shaft is being carried at a width of 14 ft., or double the usual width, and is penetrating ground heavily charged with copper. The drift south of No. 3 shaft on the third level is in good ground, but not so good as that below. Both of these drifts have been extended a distance of 425 feet.

KEWEENAW COUNTY—COPPER.

(*From Our Special Correspondent.*)

Allouez.—The new hoist for No. 1 shaft, which is being manufactured by the Nordberg Manufacturing Co. of Milwaukee, Wis., will be delivered in a few days. The foundation is completed and no time will be lost in erecting the machinery. The new hoist has a duplex cylinder engine capable of hoisting a 6-ton load from a depth of 6,000 ft. Its cylinders are 32 in. in diameter, with 72-in. stroke, and the conical drum is 18 ft. in diameter at its largest dimension. By the time the new hoist is installed the new steel rock and shaft house, which is being erected by the Wisconsin Bridge & Iron Co. of Milwaukee, will be ready. Provision is also being made for the boiler and compressor plants. The equipment is being planned to meet future requirements. It is expected that the Allouez will begin to produce within eight months from No. 1 shaft. The rock will be shipped to the Centennial's mill for treatment.

Phœnix Consolidated.—Rock shipments now average 325 tons daily and an average yield of 25 to 30 lb. of mineral per ton is being secured. The St. Clair shaft is operating to a depth of 1,800 ft. and is bottomed in a narrow but richly mineralized vein. The West vein shaft is down 950 ft. It opens a vein of liberal width, but the copper is fine and flaky, easily carried off in the tailings. About 18 drills are in service, eight being used in enlarging the reserves. Underground conditions are good. The recent assessment of $100,000 will furnish sufficient money to wipe out the deficit created during the inclement weather of last winter.

MONTANA.

BROADWATER COUNTY.

(*From Our Special Correspondent.*)

East Pacific.—At this property, 6 miles from Winston, the development is being confined to a winze from No. 4 tunnel. The ore shipments for the month will be close to $10,000. At the bottom of the 130-ft. winze is a streak of ore liberally flecked with native gold and silver. The ore streak is 14 in. wide and is fully 900 ft. below the surface. No. 4 tunnel is 2,800 ft. long. R. A. Bell owns the property, and is now considering the erection of a concentrating plant to work the second-class ore, which is estimated to amount to a tonnage on the several dumps and in the old stopes with a gross value approximating $300,000.

CARBON COUNTY.

Sunlight.—Several strikes of good ore are reported at this camp, among them a 60-ft. lead of galena and copper ore.

CASCADE COUNTY.

Anaconda Copper Mining Co.—This company has secured a contract to supply 300 tons of coal daily to the Boston & Montana smelter, at Great Falls, from its mines, at Belt.

DEER LODGE COUNTY.

Washoe Smelter.—The threatened destruction of this plant, at Anaconda, by forest fires was averted only by the most strenuous efforts.

JEFFERSON COUNTY.

(*From Our Special Correspondent.*)

Minah.—J. Campbell Cory, of Helena, has secured this old Wickes mine from J. O. Brisco on a bond and lease. The mine has had quite a history. Fifteen years ago it was purchased by an English company, which is supposed to have paid some $300,000 for the property. Afterwards the vendor claimed a breach of contract. This involved the property for several years in the courts, the vendor eventually securing full possession. The mine is opened up by four tunnels and has a gross production of some $1,200,000. It has remained practically idle for six years. It is understood that the English people still claim ownership, but they have taken no steps to assert that claim for years.

LEWIS & CLARKE COUNTY.

(*From Our Special Correspondent.*)

Jay Gould.—In August the 30-stamp mill on this property is said to have cleaned up $30,000. The mine is being operated by the Standard Ore Co. This company secured the property about two years ago, and it has gone to a heavy expense in re-opening the old workings, driving new cross-cuts, and placing machinery, including a 30-stamp mill on the property. Formerly a fine 30-stamp mill was built, which, under the old management, succeeded in pounding out a large tonnage of ore which gave up good values on the plates. The tailings were impounded, and have since been treated by cyanidation. The mine remained idle for a number of years until the present company was formed to work it. The property is at Gould, in the northern part of the county, about 50 miles north of Helena.

MADISON COUNTY.

Black Hawk.—A mill to treat the ore from this mine, near Norris, is contemplated. Charles Mason is in charge.

Elliot.—This mine, at Virginia City, is reported to be showing very favorable results from the workings.

Mammoth.—A Card concentrator and a Sperry slimer have recently been installed at this mine, near Pony. C. L. Fredericks is operating the property.

PARK COUNTY.

Cooke City Smelter Co.—This company has been organized to carry on operations near Cooke City. The directors are Halver Christensen, Otto B. Olsen and Ole Christensen, of Cooke City; George Allison, Vernon E. Bennett and Thomas Mason, of Seattle, and Fred Kuentz, of Vashon, Wash.

SILVER BOW COUNTY.

Butte Mining & Developing Co.—The management of this company announces that it has made every effort to secure needed means for carrying on operations and has failed. It is therefore compelled to abandon the enterprise, the treasury being completely exhausted. About $200,000 was put into the property.

Reins Copper Co.—A strike of good ore is reported on this company's property, at Butte. Extensive improvements are being planned for the future.

NEVADA.

LINCOLN COUNTY.

Blue Bell and Mercury.—A 4-ft. shoot of manganese is reported to have been opened up on these claims, north of Moaba.

Rainbow.—A good strike is reported at the breast of a 60-ft. tunnel at this group, 21 miles south of Moaba. D. S. Murdock and Mel Irwin are the owners.

Silver Bow.—A deposit of rich gray copper is reported to have been uncovered at the 210-ft. level of this mine, north of Los Vegas.

NEW MEXICO.

CHAVES COUNTY.

Jerry Simpson Mining Co.—This company has completed the quartz mill at its Puritan mine in the White mountains.

DONNA ANA COUNTY.

Bennett-Stephenson.—A new concentrator has been installed at this mine at Organ. A large body of ore has been blocked out on the 160-ft. level.

OTERO COUNTY.

Amarillo Mining Co.—This company is preparing to begin development on its property at Jarilla.

RIO ARRIBA COUNTY.

Dixie Mining Co.—This company, operating at Hopewell, has received a power plant to be used in developing its placer property in Crater gulch.

OREGON.

BAKER COUNTY.

Cyclone.—A good strike is reported in this mine, six miles east of Baker City.

Oregon Smelting and Refining Co.—This company's smelter at Sumpter is reported to be handling 75 tons of ore daily.

Solomon.—It is reported that a half interest in this group of 11 claims in the Greenhorn district has been sold to Cincinnati capitalists for $15,000.

CROOK COUNTY.

Oregon King.—It is reported that this mine at Aschwood has closed down permanently, as the result of pending litigation.

DOUGLAS COUNTY.

Benefit and Lost Province.—Good strikes are reported on these claims at Bohemia. They are owned by G. G. Warner.

Mayflower.—A 5-stamp mill is to be installed at this property in the Bohemia destrict.

JACKSON COUNTY.

Ott.—A 10-stamp mill will be installed on this property near Jacksonville.

JOSEPHINE COUNTY.

Lewis and Clarke.—An important find of tellurium is reported at this mine near Kirby. Ore is being shipped to the Selby smelter.

Lucky Queen.—A 10-stamp mill is contemplated for this mine at Merlin.

UMATILLA COUNTY.

Preston-Parton Mining Co.—This company will start up its mill at Athena after an idleness of two years. New machinery has been installed.

PENNSYLVANIA.

ANTHRACITE COAL.

Payment of Check Weighmen.—Judge Gray has rendered a decision on the controversy over the payment of check weighmen and check docking bosses. He virtually upholds the stand taken by Carroll D. Wright, umpire of the Conciliation Board, though stating that Mr. Wright's opinion, as expressed in a decision on another matter, was only a monition. After reviewing the controversy at length, Judge Gray says, regarding the contention of the operators that the laws of the State prohibited them from assessing men who had not made the necessary assignment of wages:

"I have examined the statutes to which reference has been made, and do not think that the interpretation I have given to the fifth award of the Anthracite Coal Strike Commission at all conflicts with the requirements of the same. The courts of Pennsylvania, however, are the proper and only competent tribunals for the settlement of the question.

"My adjudication is that the fifth award requires:

"(1) That check weighmen and check docking bosses shall be employed at any of the collieries wherever required by a majority of the contract miners there.

"(2) That the wages of said check weighmen and check docking bosses shall be fixed, collected and paid by the miners (meaning all the miners of said colliery), but in such a manner as the said miners shall by a majority vote elect.

"(3) That when proper requests provided in the award have been made by a majority of the miners at any colliery it is the duty of the management of the colliery, under the award, to co-operate with the miners of said colliery in the establishment of check weighmen and check docking bosses and pay the wages out of the proportionate reductions from the earnings of the contract miners of the colliery who are employed or continued in employment after due notice of the employment of check weighmen and check docking bosses under the propositions of the award.

"(4) That no assignment of earnings for that purpose is necessary to the due performance of the requirements of the award."

As regards the liability of the operators in case some miner should sue to recover a deduction made with his tacit consent Judge Gray says: "In the case we have in hand, it would be quite sufficient to simply post a notice at the mouth of the mine, or in the office where the wages and earnings are paid, that such deduction will be made. Therefore, those who enter on, or continue in, the employment, do so with the understanding that this is a stipulation in their contract."

UTAH.

JUAB COUNTY.

(*From Our Special Correspondent.*)

Tintic Ore Shipments.—For the week ending September 24 shipments aggregated 105 carloads, as follows: Bullion-Beck, 7; Centennial-Eureka, 21; Eagle & Blue Bell, 8; Grand Central, 5; Godiva, 6; Gemini, 31; May Day, 1; Mammoth, 10; Star Consolidated, 3; South Swansea, 1; Uncle Sam (crude), 3; Uncle Sam (concentrates), 3; Yankee Consolidated, 6.

Mammoth.—This company's mill will be put in commission within a few days. Good progress is being made in sinking the shaft from the 1,900 to the 2,100-ft. level.

SALT LAKE COUNTY.

(*From Our Special Correspondent.*)

Bingham Consolidated.—The copper bullion shipments from this plant during the week ending September 23 aggregated 244,817 pounds.

United States Smelter.—Copper bullion shipments from this plant aggregated 246,829 lb. during the week ending September 23.

Utah Consolidated Smelter.—Shipments of copper bullion during the week ending September 23 aggregated 305,395 pounds.

SUMMIT COUNTY.

(*From Our Special Correspondent.*)

Daly-Judge.—Development work is progressing according to the plan outlined by the management several months ago, and with very favorable results.

Homestake.—Work has been resumed on this property under the direction of Thomas Cupit, of Park City.

Keith-Kearns.—A strike of more than ordinary importance is reported on this property.

West Quincy.—A vigorous campaign of development has been begun at this property.

WASHINGTON.

OKANOGAN COUNTY.

Palmer Mountain Gold Mining & Tunnel Co.—This company is driving a large cross-cut tunnel at its mine on the southeast slope of Palmer mountain. Power for the mine's operation is furnished by a waterfall about two miles distant.

SNOHOMISH COUNTY.

Mackinaw.—The lower tunnel of this mine, at Everett, has reached a length of 175 ft. Good ore is said to be exposed.

WYOMING.

CARBON COUNTY.

Congo.—The Congo vein is said to have been encountered in this mine north of Dillon.

LARAMIE COUNTY.

Hecla Copper & Gold Mining & Milling Co.—This company's mill at Hecla is being equipped with the Ohly process of extraction, by which it is expected to save a number of by-products.

NATRONA COUNTY.

Powder River Oil Co.—It is reported that the flow at this company's wells exceeds 5 bbl. a day at a depth of 240 feet.

FOREIGN MINING NEWS.

AFRICA.

RHODESIA.

The Chamber of Mines report shows a production of 24,339 oz. gold, 5,864 oz. silver and 46,870 tons of coal in July.

TRANSVAAL.

Production in August, as reported by the Transvaal Chamber of Mines, was 312,277 oz. fine gold, which is 4,437 oz. more than in July, but is still 2,203 oz. less than the recent maximum output, which was reached in May. For the eight months ending August 31, the total production was 2,435,330 oz. fine gold, which compares with 1,837,134 oz. in the corresponding period in 1903, showing a gain of 598,196 oz. this year. The scattering returns from individual mines indicate that the recent increase in output has come largely from the deep-level mines.

AUSTRALIA.

NEW SOUTH WALES.

(*From Our Special Correspondent.*)

As the result of the past half year's operations the Broken Hill Proprietary Co. reports a net profit of £107,698, and shows an excess of liquid assets over liabilities of £415,283. The output of bullion during this period was a record one, and amounted to, silver, 2,525,576 oz. fine; gold, 768 oz., and lead, 34,280 tons. The quantity of ore raised was also in excess of any previous period, amounting to 305,512 tons, and notwithstanding this large output, development work has been kept well ahead. At the 1,000-ft. level the lode has been opened up for a length of 640 ft., and has been proved to be of the usual grade and width. The sintering of the slimes has enabled the company to materially augment the output of bullion, the slimes despatched to the smelters amounting to to 32,272 tons. The zinc concentrates disposed of for shipment to Europe aggregated some 1,000 tons. The position of this company can best be realized when it is stated that the subscribed capital amounts to £384,000; the dividends and bonuses paid in cash amount to £8,336,000, while as the result of the sale of a portion of the company's original holdings, shares in other companies to the nominal value of £1,744,000 have been distributed to the shareholders.

Some time since proceedings were instituted in the Arbitration Court by the Colliery Employees' Federation, representing the Northern district of New South Wales, for an increase in wages and a general review of working conditions. With the object, if possible, of arriving at an amicable agreement, delegates representing the colliery owners and the employees met in conference and settled conditions which it was considered would prove acceptable to all concerned. This agreement was submitted to the several Miners' Lodges, but, on a ballot being taken, it was rejected. The matter must now be decided by the court, and the hearing will probably drag over several months and cannot but result in considerable expense and loss of time to both sides. In this connection it is interesting to note that last year the colliery owners were put to an estimated loss of between £50,000 and £70,000 to secure industrial peace, and that they must now submit to further "squeezing" to satisfy the caprices of the men. In actual practice compulsory arbitration, in so far as it professes to prevent strikes, has proved to be a failure, for the reasons that men cannot be compelled to work on terms which are not agreeable to them, and if the men strike in a body their numbers prevent them from being apprehended, and even if apprehended their punishment would be almost, if not quite, an impossibility. Under such conditions it is not to be wondered at that the mine-owners, in common with other employers, express much satisfaction at the recent trend of political events. The Labor Ministry of the Commonwealth Parliament has been deposed after a short term of office, its downfall being due to its insistence of a clause in the Federal Arbitration Bill giving preference of employment to unionists. A similar provision to this has been incorporated in several of the awards of the State Arbitration Court in New South Wales, and has come to be regarded with general disfavor. The ill-effects of such a clause is illustrated by the action of the Sydney Wharf Laborers' Union which closed its roll of members and declined to admit any other qualified applicants. Men who did not belong to the union were perforce thrown out of employment, while the members of the union were converted into a close corporation dominating their employers. A further check to the aspirations of labor has been administrated at the general elections for representatives in the State Parliament of New South Wales. The Liberal party has been returned with a workable majority, and the Labor party has been ousted from the dominating position which it has held for a number of years. These incidents in both the Federal and State Parliaments are taken as an indication that good government will speedily replace class legislation and destroy the barriers to industrial progress which have been set up.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—Shipments for the week ending September 17 were as follows, in tons: Granby, 11,870; Mother Lode, 2,752; Emma, 1,088; Mountain Rose, 99; total for week, 15,759 tons; for the year, 566,459 tons.

BRITISH COLUMBIA—ROSSLAND DISTRICT.

Rossland Ore Shipments.—Shipments for the week ending September 17 were as follows, in tons: Le Roi, 2,000; Centre Star, 1,450; War Eagle, 1,260; Le Roi No. 2, 480; Le Roi No. 2, milled, 300; Spitzee, 30; Jumbo, 300; Cliff, 30; Velvet-Portland, milled, 250; White Bear, milled, 100; total, 6,200 tons; year to date, 251,908 tons.

YUKON.

(*From Our Special Correspondent.*)

Yukon.—The output of gold mined in the immediate vicinity of Dawson in August was valued at $1,539,518, as compared with $1,300,250 for July. This output is considered unusual for a month in which the rainfall is generally light, but this year copious rains fell, so that there was no shortage of water. Returns for Forty-Mile and Whitehorse have not yet been received, and the above amount does not show the full production of the Yukon Territory for August. It is estimated that the total output for the season will be about $10,000,000, this estimate being based upon the reports of the comptroller, to whom the export tax on all gold shipped out of the country is paid. The government computes the amount of the tax payable on a basis of $15 per oz., but the general average value of the gold is above $16 per oz., and it is on this latter valuation that the above estimate of total value of the season's output is based.

The hydraulic lease issued September 1, 1901, in favor of the Alaska Northwest Exploration Co. for a tract of land on Ten-Mile creek, a tributary of Sixty-Mile river, will be cancelled on 19th inst., the lessees having neither paid rent nor performed the work necessary to enable them to continue to hold the ground. This concession will be open to staking by free miners on the latter date. As good pay was reported to have been struck last summer on the adjoining concession, held by the Syndicat Lyonnais, the ground now to be thrown open will probably be staked. It is known as the Bowie concession, having been first granted to Colonel Bowie and by him assigned to the Alaska Northwest Exploration Co.

Recent reports from the Tanana state that most of those who have gone there without supplies for the winter or money to provide for their wants are likely to suffer much privation before next spring. While the prospects for the future of the camp are considered to be most promising, much of the ground on the Cleary, the richest creek in the district, is stated to be from 45 to 60 ft. deep, so that in most cases it is only after a lengthy period of prospecting that the pay streak is located. High freight rates have been almost prohibitive the past summer, so far as getting in machinery to work the claims is concerned, consequently another season's work must be done before the field will be productive enough to support even those already dependent upon it.

Rails and other material for Falcon Joslin's Tanana railway have been arriving in Dawson during the latter part of August, and going thence down river to Chena. Those who have been over the proposed route of the road describe it as without engineering difficulties, and having plenty of timber near at hand for ties, bridges, etc. From the lower terminus, which will probably be at Chena, to Golden, on Pedro creek, the distance will be about 20 miles. It is proposed next season to continue the road over the divide to Cleary and Fairbanks creeks.

W. W. Tinkham has returned to Dawson from a six-weeks' trip through the Forty-Mile country. He visited every creek in that section on which gold had been discovered and men are at work. When in the Ketchemstock hills he was 175 miles distant from the mouth of Forty-Mile, yet still in the watershed of that stream. He reports the existence of large areas of bench gravels suitable for hydraulicking, while there are many bars that could be dredged; also that there is a fine body of quartz in the Ketchemstock hills over the divide from which head streams tributary to the Tanana. He considers the probable continued productiveness of the Forty-Mile country, which it is estimated will this season show a total production of more than $200,000 generally undervalued. Much of the output just mentioned is from the United States side of the boundary line, but the bulk of this gold passes through the business houses and banks of Dawson.

NEW CALEDONIA.

Exports for July and the seven months ending July 31 are reported as follows by the *Bulletin du Commerce*, of Noumea, in metric tons:

	July.	Seven months.
Nickel ore	$9,018	$32,070
Cobalt ore	660	4,132
Chrome ore	8,356	21,030

The production of chrome ore continues to increase, and several new mines are being opened.

NEW ZEALAND.

Exports of gold for July and the seven months ending July 31 are reported by the Mines Department as follows, in ounces of bullion:

	1903.	1904.	Changes.
July	$55,902	$48,013	D. $7,889
Seven months	313,110	315,318	I. 2,218

The bullion exported for the seven months this year was equal to 283,503 oz. fine gold, or $5,860,012. Exports of silver for the same periods were as follows, in ounces:

	1903.	1904.	Changes.
July	$65,407	$150,680	I. $85,273
Seven months	429,069	546,752	I. 117,683

The greater part of the silver was from the gold mines in the Hauraki mining district.

MINING STOCKS.

(Full quotations on pages 535 and 536.)

New York. Sept. 28.

Speculatively speaking, the market has broadened, and if the good humor continues that is being shown in trading in those industrials that have been the target of the bears for so long, a revival of public interest is near. Especially interesting has been the support, apparently of insiders, of the securities of the United States Steel Corporation, the common shares of which have advanced to $18.125, and the preferred to $70.75. Similar strength is also manifest in American Smelting & Refining, whose common stock touched $67.50, and preferred, $109.75.

Amalgamated Copper was not so fortunate this week, and with a diminution in sales has come a reaction in quotations, the low mark being $57.625. Anaconda was sympathetically weak, touching $23.25, notwithstanding the rumor that the forthcoming dividend would be larger. Greene Consolidated kept the curb brokers on the alert, and with the declaration of another 3% dividend—the third this year—the stock was elevated to $18. Later profit-taking sent Greene shares down to $16.125. Tennessee holds its own, making few

sales at $31.375@$32.50. White Knob, of Idaho, was quiet at $3.50@$3.25.

Horn Silver, of Utah, is in demand, and the announcement of another quarterly dividend of 5c. per share has steadied the price at $1.65. After a long absence Ontario Silver has re-appeared with a sale at $4.

The Comstocks are dull and quiet, Ophir selling at $2.35, Consolidated California & Virginia, $1.05, and Hale & Norcross at 62@63c. per share.

Boston. Sept. 27.

(From Our Special Correspondent.)

There seems to be a trifle more optimism in the mining share market, and after a short period of dulness trading is picking up somewhat. At present the activity is in specialties, yet the undertone of the whole list is one of buoyancy. Trinity was taken in hand to-day and advanced to $8.75, closing at $8.25, against $6.87½ a week ago. A circular issued by one of the original holders which shows better conditions at the property than was generally supposed was responsible in part. Isle Royale on active trading has risen $3.62½ to $22.62½, although the closing to-night was $20.87½. Allouez is selling with a $1.50 assessment paid, at $15.50, a net advance of $2 for the week.

United States has advanced over $1 to $21 on concentrated buying, although the management discourages expectation of 50c. quarterly dividends. Old Dominion has advanced $2.50 to $17.50 on light trading, showing that little stock is pressing for sale. One furnace at the new smelter has started, and the second will be blown in shortly. A monthly production of 4,000,000 lb. is expected right away. The mine is said to be opened up for over three years ahead.

Adventure, which was selling at 75c. a few weeks ago, is selling at $3.62½ to-day, with $1 assessment paid. Buying easily put the stock up. Shannon has been fairly active up to $4.50 on the announcement of an important strike. Calumet has risen $10 to $820, and Utah has advanced $1.75 to $41.25. A few buying orders caused Osceola to advance $5.75 to $82.25, with subsequent reaction to $80; the close to-night is $81. Wolverine settled to $85, but rallied to $89. Copper Range rose to $58.25, closing to-day at $57.25.

Colorado Springs. Sept. 23.

(From Our Special Correspondent.)

Trading in Cripple Creek shares on the local exchange was not as active as the previous week, with a weakness in price noticeable in a number of stocks, which is probably due as much to politics as anything else. The week did not pass, however, without a strike of unusual proportions, but, coming late, this has not been verified as to actual values. State conventions for both parties being over, more attention will undoubtedly be given to stocks, and the next week should show more strength.

El Paso dropped a fraction during the week, and sold to-day for 94¾. Elkton has gone down from 64½ to 61½c. C. K. & N. sold last week for 27½ and closed 25c. asked, with no sales. Isabella has gone down to 20 asked, and no sales. Portland is selling at $1.60 per share.

Salt Lake City. Sept. 24.

(From Our Special Correspondent.)

The condition of the mining stock market has been somewhat better this week, and a number of stocks have ended with an increase in price to their credit. This has been the case with some of the lower priced traders particularly, while those of a higher grade have remained firm at last week's quotations. There has been very little trading done in Daly-West. This Park City company has entered into an arrangement with the Ontario Company, whereby the Ontario drain tunnel is to be extended to Daly-West territory. This will enable the latter to reach ore bodies now inaccessible without first going to enormous expenditure in providing pumping equipment. Uncle Sam Consolidated has dropped a few points on account of the destruction of its hoisting plant by fire on this date. Notwithstanding the announcement that no dividends will be paid by the Sacramento for some time, the stock has found demand at strong prices. Columbus Consolidated has been active at advancing figures. This company's new 150-ton mill will go into commission within the next two weeks. Some trading has been done in Nevada stocks—Tonopah and Goldfield.

San Francisco. Sept. 22.

(From Our Special Correspondent.)

There is nothing especially new in the Comstocks, business being on a moderate scale, with few variations in prices. Some quotations noted are: Ophir, $2.30; Best & Belcher, $1.10; Consolidated California & Virginia, $1.10; Mexican, $1; Gould & Curry, 19c.; Crown Point, 13c.; Potosi, 12c.; Savage, 10c. per share.

On the San Francisco & Tonopah exchange business was fairly active and prices very well supported. Fluctuations were not great, and buying was on a fair scale. Montana Tonopah sold at $2; Goldfield Nevada, 75c.; MacNamara, 40c.; Tonopah North Star, 25c. per share.

On the California exchange, trading in oil stocks was rather light, and prices were accordingly somewhat depressed. Kern River sold at $12.50; Reed Crude, $1.50; Claremont, 75c.; Independence, 28c. per share.

COAL TRADE REVIEW.

NEW YORK, Sept. 28.

ANTHRACITE.

With October at hand, the anthracite coal trade is naturally gaining strength. The short-lived cold wave last week started brisk retail buying over a wide territory, and this has naturally had some effect on wholesale business. Still the markets in the principal centers of consumption remain quiet. The companies continue to restrict production, and it is likely that the output for September will be less than that for August.

In the Northeast there has been some increase in retail buying, but the wholesale market shows little improvement, except that dealers having small yards at inland points are beginning to put in final orders for winter needs. In Chicago territory there was some increase in activity last week, but the wholesale trade has for the most part relapsed into quietness. Demand at country points is increasing, but in the cities there is comparatively little buying as yet. Along the lower lakes and in Canadian territory conditions have improved slightly; the movement of coal by rail shows little change, remaining steady. Shipments up the lakes from Buffalo have fallen off, owing to the congestion at upper lake receiving docks. Along the Atlantic seaboard business still feels the effects of the liberal buying last spring, and wholesale demand is generally light. Cooler weather has had some effect on the retail trade. Generally speaking, the market in this territory is listless, but dealers expect a slow improvement from now until blizzards howl, and coal is burnt up fast.

BITUMINOUS.

The Atlantic seaboard bituminous trade shows a slightly better demand. Prices remain unchanged, although central Pennsylvania coals seem to be much stronger than they were, and the lowest prices paid now are for West Virginia gas coal. There is some complaint of short car supply by shippers on the Chesapeake & Ohio, Norfolk & Western and New York Central roads. On the other roads the supply is up to all demands of the trade. If this car shortage should spread it probably will be felt first in territory where coal is now received all-rail after a long through haul. The agreement that holds together the Coastwise Carriers' Association will expire on October 1. Nothing has been published as to its renewal, although it probably will not be renewed.

In the far East the demand has improved considerably of late, and several coal ports are reported blocked by vessels waiting to discharge, and in some cases consumers have held up orders in order to escape paying demurrages while the blockades continue. Trade along Long Island Sound has shown a decided improvement during the week. New York harbor trade is quiet, though stronger for certain grades. The all-rail trade maintains its own, and there is little heard of price cutting.

Car supply at the mines is good on the Baltimore & Ohio and Pennsylvania railroads, but poor on the others. Transportation from the mines to tidewater is reported variable. In the coastwise vessel market there are vessels enough available to go round, and the restrictions of the Coastwise Carriers' Association have little effect. We quote current rates from Philadelphia as follows: Providence, New Bedford and Long Island sound, 60c.; Boston, Salem and Bath, 75c.; Lynn, Newburyport and Bangor, 85c.; Portsmouth, 80c.; Saco, 90c. and towages; Gardiner, 80c. and towages. From New York harbor to points around Cape Cod the rate is 50c. The above figures are low, but captains take them more cheerfully than some weeks ago, as they are getting good rates on west bound merchandise.

Birmingham. Sept. 26.

(From Our Special Correspondent.)

The coal and coke production in Alabama during the third week of September was larger than during any week since July 1, and the operators anticipate a still better production the present week. The importation of non-union labor into this district is going on at a rapid rate. The new hands are getting acquainted with the work in these mines. The leaders of the union miners on strike say that the companies are not getting out a good quality of coal, and that the strike is a most expensive one for the operators.

There is a large production of coal at the mines where temporary contracts with the union miners are in effect, and at the mines operated by non-union miners and convicts.

A report from Cullman county, north of Birmingham, announces that a seam of coal, apparently high grade, has been discovered there, and that a company will be organized at once to work it. The Stout Mountain mines are just across the Cullman county line in Blount county.

The Tennessee Coal, Iron & Railroad Co. has succeeded in starting up some of the mines at Blocton, in Bibb county, and at Pratt mines, in Jefferson county, non-union miners being given employment. The non-union mines in Walker county are working.

Chicago. Sept. 26.

(From Our Special Correspondent.)

Wholesale business in anthracite is improving slowly; trade in bituminous is holding its own for the most part, but becoming demoralized on fine coal because of the very low prices. The increase in sales of anthracite is mostly in the country; city consumers are apparently more confident of obtaining supplies quickly when cold weather sets in, and retailers refuse to put in larger stocks until they can sell more. All over Chicago territory there has been cold weather for the season, in the last week, and this has stirred the country trade. Transportation conditions are considered by leading wholesalers so good that no apprehension need be felt for the anthracite movement when the big demand comes, but every dealer would prefer a better distributed business and is seeking to get it wherever possible.

The coming of cool weather also has stimulated somewhat the trade in prepared sizes of bituminous for domestic use. Steam coals generally are weak, though no weaker than they have been for a month past. Screenings are very weak and bring no profit; many sales, it is said, do not pay freight charges from the mines. Run-of-mine is also in light demand and prices are low. Lump shows a little activity, but no increase in prices.

Of Eastern coals, Hocking is still in short supply, owing to car shortage, and the price is firm at $3, with rumors that it will be advanced October 1. Smokeless is selling well, with demand and supply well adjusted, at about $3 for run-of-mine. Prepared sizes of smokeless are in somewhat short supply and good demand. Youghiogheny is in light but steady demand at $2.75@$2.85 per ton.

Cleveland. Sept. 27.

(*From Our Special Correspondent.*)

The coal situation has shown a decided improvement, most marked in the steam coal trade. The demand has been so sharp that the coal mines are all running at the height of their capacity, and in some instances they have begun to complain about a shortage of equipment with which to handle the material away from the mines. In accordance with the better demand, the prices have stiffened. Steam coals, run of mine quality, are now selling at $1, an advance of 5 to 10c., at the mine. Some mines are holding for a little better prices. There has been also an improvement in the demand for slack. The market there is pretty weak, with exception of the contract end of it. No one is willing to make any contracts under 50c. at the mines. Spot shipments are made at 30c. at the mines. The few cold days of the past week brought out a better demand for domestic coal also. Prices hold steady by agreement at $2.30 at the mines for Massillon; $1.60 at the mines for Coshocton, and $1.30 at the mines for Goshen.

There is a little better demand for coke also, and the market has stiffened somewhat, although there is no material change. The lake coal situation is without change, the upper lake docks being still crowded and the movement of coal being checked in consequence.

Pittsburg. Sept. 27.

(*From Our Special Correspondent.*)

Coal.—The car shortage has been severely felt in Pittsburg district, and during the week Pittsburg Coal Co. was forced to close 13 mines on account of a scarcity of railroad cars. An official of the company declared that there is a big improvement in transportation facilities it will be impossible to fill the contracts taken for the northwestern market. It was expected that the lake shipments this season would exceed last year despite the delay at the opening of the season caused by the strike of vesselmen. The demand is improving but there has been no great increase in prices. Run-of-mine coal, which has been quoted for some time at $1@$1.10, cannot be had for less than $1.05 at the mine.

Connellsville Coke.—An order has been issued to fire all the ovens of the H. C. Frick Coke Co. Last week a number of active ovens in the region increased from 16,810 to 17,657. In the report of the *Courier* the production for the week is given at 209,791 tons, compared with 194,761 tons the previous week. Furnace coke is still quoted at $1.50 and foundry at $1.85@$2. The shipments for the week aggregated 11,079 cars, distributed as follows: To Pittsburg and river points, 3,682 cars; to points west of Pittsburg, 6,021 cars; to points east of Connellsville, 1,376 cars.

San Francisco. Sept. 22.

(*From Our Special Correspondent.*)

The coal business continues very quiet here. Domestic demand is naturally light at this season, and fuel oil continues to make raids upon the steam coal trade.

Prices, however, show very little change. For Pacific Coast coals in large lots to dealers quotations are: Wellington and New Wellington, $8; Richmond, $7.50; Roslyn, $7; Seattle and Bryant, $6.50; Beaver Hill and Coos Bay, $5.50; white ash, $5.25. For Rocky Mountain coals, also in large lots to dealers, prices named are $8.50 for Castle Gate, Clear Creek, Rock Springs and Sunnyside; Colorado anthracite brings $14. For Eastern coal, quotations are largely nominal, supplies being light. Pennsylvania anthracite is $14 and Cumberland $13. For English coal quotations are, ex-ship: Welsh anthracite, $13; Cannel, $8.50; Wallsend and Brymbo, $7.50 per ton.

IRON TRADE REVIEW.

NEW YORK, Sept. 28.

While current buying is comparatively quiet, the general tone of business undoubtedly shows an improvement. Buyers have responded rather slowly to recent reductions in pool prices, apparently not so much because they do not need material as because there is a suspicion in some quarters that further reduction may be made. Indications are, however, for an improved demand, and the mills and furnaces are generally making preparations for it. Makers protest that further concessions are not possible, but about this there may be, of course, two opinions.

The general situation is that most people are looking for better business before long, and that there is more confidence in the ability of the country to take manufactured products.

Birmingham. Sept. 26.

(*From Our Special Correspondent.*)

The pig iron market in Alabama is somewhat quiet. Some of the larger producers are holding their prices up and not rushing into the market. The production in this State is still short of what it was the first of the year, but there is no haste to improve the conditions in this way, notwithstanding there is a better coal and coke production, though the coal miners' strike continues. The Tennessee Coal, Iron & Railroad Co. is re-lining one of its bessemer furnaces, and has a good force of men at work around two or three of the others there. President J. C. Maben, of the Sloss-Sheffield Steel & Iron Co., states that his company is holding No. 2 foundry for $9.50 per ton. He did not deny that he had heard again of $9.25 per ton iron. Rumors that this price has been undersold is positively denied. The shipments of iron from this district are about the same as they have been. There is not a great amount of iron accumulated in the yards hereabouts.

The following quotations are given: No. 1 foundry, $9.50@$10; No. 2 foundry, $9.25@$9.50; No. 3 foundry, $8.75@$9; No. 4 foundry, $8.50@$8.75; gray forge, $8.25@$8.50; No. 1, soft, $9.50@$10; No. 2, soft, $9.25@$9.50.

The demand for finished iron and steel is not very active. The bessemer rolling mills of the Tennessee Coal, Iron & Railroad Co. are still producing, though not on a very large scale. Non-union men are being employed there exclusively. Several of the more efficient of this labor left the plant during the past week.

Steel production in this section continues healthy. The Tennessee Coal, Iron & Railroad Co. is delivering steel rails on orders taken some time since. The Alabama Steel & Wire Co. is using its steel manufactured at Gadsden in the manufacture of steel rods, wire and nails.

Cast iron pipe is in good demand, and the plants are busy.

Chicago. Sept. 26.

(*From Our Special Correspondent.*)

Sales of pig iron in the last week have been heavy, and to all appearances are destined to continue heavy for another week. Agents are elated and see in the favorable conditions the beginning of a boom, but it is not to be forgotten that the local market is a variable one. We have had several such apparent beginnngs of prosperous periods that proved only temporary. The present condition of things, however, is good and there are no signs of a relapse. Northern iron especially is in demand, a condition explained by those that handle it largely as due to better facilities given by the railroads so that shipments can be made without delay from furnaces near at hand. Southern, however, is selling well and holds up stiffly in price—$9.50@$9.75 Birmingham or $13.50@$13.40. Chicago—on most sales. Northern brings $13.50@$13.75 for No. 2.

Sales are running larger than the ordinary sale of the last two or three weeks, 350 to 700 tons. Lots of 1,500 to 2,000 tons are now common, making the volume of sales much larger. "Our business is 50% to 60% larger than it was two months ago," reports a leading firm of selling agents. The best of the increase, as this house sees it, is that the climb has, despite set-backs from week to week, been a gradual one.

Charcoal iron is in steady, though not heavy, demand, at $15.50. Trades are not running beyond February 1 next, and most of them are confined to January 1. The prudence of sellers rather than the limitations of sales seems to be causing the restriction as to time, and this is another feature of the market indicating confidence of an advance in prices.

Cleveland. Sept. 27.

(*From Our Special Correspondent.*)

Iron Ore.—There is still some talk of possible better conditions in the iron ore trade. It seems, however, too late in the fall to expect any radical changes in the situation. The market appears to be on the decline rather than on the increase, some evidence being seen of a slight decrease in the amount of material being brought down the lakes. The prices hold, although nominal, as they have been, being based on $2.60@$2.75 for non-bessemer Old Range and $2.40@$2.50 for non-bessemer Mesabi. The rates of carriage have also remained stable at 65c. from the head of the lakes, 60c. from Marquette and 50c. from Escanaba.

Pig Iron.—It must be said that the predominant tone of the pig iron trade in this territory is quietness. The past week has seen a little change for the better in the situation, there being slight improvement in the inquiry, although hardly in the buying. The market just now seems to be holding off. The producers insist that no material is for sale at the old prices, while the buyers insist that they will not pay the advance. Producers are holding for $12@$12.25 in the Valleys for No. 2 foundry.

Finished Material.—There has been a considerable improvement in the demand for structural steel. The market responded to the cuts, and some buying which was held back and also some new contracts are coming out.

The reports, however, indicate that much of the buying which has been done has been merely a precautionary measure, not representing actual needs. On many of the contracts for structural material and plates there have been no specifications whatever. The reduction in bars did not bring out any better buying than has been the case heretofore. The effect of the cut was not very marked therefore. The improvement in bar iron is especially remote, and the prices hang about as they have. Bar iron is quoted 1.25c. at the mill, while bessemer steel bars hold at 1.30c., Pittsburg, and open-hearth bar steel is unchanged at 1.35c., Pittsburg. There has been no change in sheets.

New York. Sept. 28.

Pig Iron.—The general tone of the market is stronger. For northern iron we quote: No. 1X foundry, $14.75@$15; No. 2X, $14@$14.40; forge, $13@$13.25. For southern iron on dock prices are about as follows: No. 1 foundry, $13.50; No. 2, $13@$13.25; No. 3, $12.75@$13.

Plate.—Demand remains light. We quote 1.545c. for ¼-in. tank plate in carloads at tidewater, with other grades in proportion.

Steel Rails.—Quotations are still $28 for standard sections, f. o. b. mills. Quotations for light rails range from $21 for 40-lb. up to $24 for 12-lb., f. o. b. mills in large lots.

Structural Material.—Recent price cuts have not led to many new orders from consumers. We quote on large lots at tidewater, 1.55@1.80c. for beams, angles and channels.

Philadelphia. Sept. 27.

(*From Our Special Correspondent.*)

Pig Iron.—The volume of business in pig iron since the rearrangement of prices has been disappointing to many of the larger producers. Our people say that they are doing a fair business, that prices are steadier than they were a short time ago, that there are inquiries in the market for winter delivery, that some contracts have been made for delivery after January 1, and that consumption both in forge and foundry is larger. This about summarizes the situation as expressed by leading pig iron makers and brokers. It is admitted on all hands that prices are at their lowest. The bar mills are running better but only a few of them full time. Forge is dragging and No. 2 foundry leads in activity and firmness in price. Basic iron is showing up better than it has for some months. Quotations may be given at $15.25 for the better grades of No. 1 X foundry. No. 2 X has sold as low as $14, though some brands are held at $14.50; No. 2 plain $13.50; standard forge iron is held at $13 but more sells below than at that figure. Basic is $13.

Steel Billets.—The modification in prices has led to a larger demand for billets but not to the anticipated extent.

Bars.—The revised quotations have let in quite a lot of business and prices are now regarded as settled.

Sheets.—The fact that most mills are now running to full capacity is a favorable indication. Some heavy orders are dropping in occasionally and salesagents are endeavoring to demonstrate to their customers that there are indications of stronger prices after election. This argument is being used with considerable force and not without some success.

Pipes and Tubes.—There has been a general resumption of work in a great many establishments in Eastern and Middle Pennsylvania where tubes are largely used and merchant pipe to some extent.

Merchant Steel.—The consumption of merchant steel is still restricted. A good deal of capacity in this branch is still idle or not fully engaged. In a small way concessions are not to be had and business is not done in large lots in this territory.

Cast Pipe.—Cast pipe is under a great deal of inquiry even at this time. The season for laying pipe is nearly at an end, excepting in southern territory, and our pipe makers are now figuring, and with probable success, on securing quite a bunch of orders for municipal requirements in cities and towns in the South.

Plates.—The plate mills have more business this week than two weeks ago and at present the managers think that the chances for filling up before election are good. Tank and bridge iron 1.48½; marine 1.78½; locomotive firebox 2.08½c.

Structural Material.—The new list prices suit all hands, and quite an improvement in business developed within a few days in a small way. The ship yards are better buyers than they were; the bridge-builders are getting in shape to do some heavy winter work and the smaller construction requirements are important.

Old Rails.—Old iron rails are offered at $16; no business is reported.

Scrap.—A good deal of scrap has been quietly picked up during the past week; for No. 1 steel, prompt delivery, 50c. more is asked today. All kinds of scrap are firmer than at any time for months, and the larger consumers are figuring on heavy buying, but nothing of magnitude has been closed yet.

Pittsburg. Sept. 27.

(From Our Special Correspondent.)

The iron and steel markets are quiet this week, all buying being confined to small lots, but there is plenty of business on the books, and all the mills are operating satisfactorily. Pig iron sales are not as great as was expected last week, some deals that are under negotiation not yet being concluded. While there are many inquiries for iron for deliveries extending into next year, consumers evidently anticipated lower prices, due to the reductions in steel. Pig iron makers, however, are not inclined to make any concessions from the prevailing prices contending that the low point in iron prices was reached long before any cut was made in the rates for steel. Southern iron prices are higher on account of the coal strike, and one interest that required southern forge was forced to pay $1 a ton more than the material could have been had at northern furnaces. The movement in foundry and gray forge shows a great improvement this week, and prices are very firm. One of the Westinghouse interests is in the market for 2,000 tons of foundry iron in addition to the 8,000-ton order placed last week. A heavy demand for pig iron is expected, and furnaces are preparing for it. It is not likely that active buying will begin much before the first of the year. That the United States Steel Corporation intends to put all of its idle furnaces in blast is indicated in the order issued last week by the H. C. Frick Coke Co., a subsidiary concern, to fire all the idle ovens in the Connellsville region. Work on repairs at a number of furnace plants is being rushed, and several additional furnaces are to be blown in during the next two weeks. The Soho furnace of the Jones & Laughlin Steel Co. was started last week and the fifth stack of the Eliza group will be put in blast as soon as the work of re-lining is completed. The company will then be operating its capacity in the blast furnace department. Its big steel plant is running full in almost every department, and has enough business in sight to keep it in steady operation throughout the year.

The reduction in prices of billets and sheet bars has not had any material effect on the market so far, but likely will make competition more keen in the sheet and tin plate trade. It is reported to-day that a large independent tinplate concern has just captured a good customer from the American Sheet & Tin Plate Co. and closed a contract for 22,000 boxes at the prevailing price. In order to get this contract it had to pay the concern something like $3,200 due in rebates from the leading interest. The big company, however, is getting new business, which is indicated by the resumption at some of its plants. The large plant at New Castle was recently put in full operation, and yesterday 14 of the 26 mills at the plant at Elwood, Ind., were started. Orders have just been issued to start the Monongahela works on the South Side on October 1. This is an eight-mill plant, but the Bray semi-continuous system has been installed there, and the product is equal to that of a fourteen-mill plant. Independent sheet and tin-plate companies are greatly interested in the plan of the Republic Iron & Steel Co. to add a sheet-bar mill to its steel plant at Youngstown. It is reported that the new mill will be completed and in operation about January 1. The cut in the price of sheet-bars was evidently not sufficient to have any effect on the price of sheets, and if there is any shading it has not been noticed. The wire mills continue busy, and indications point to the breaking of all records for production this year. The fight between the American Steel & Wire Co. and some of the western mills is still on, and jobbers are taking advantage of it to stock up heavily. Prices in the Pittsburg district are very firm at $1.60 a keg for nails and 1.45c. for plain wire.

Pig Iron.—There is a good inquiry for all grades of pig iron, but sales are limited, as furnaces will not concede the terms offered. One or two 200-ton lots of bessemer were sold at $12, Valley furnace, and the sale of a larger lot is reported at $11.90. Some basic iron was sold at a trifle under the quotations for bessemer, and several sales are recorded of foundry and forge iron. Prices named this week are about as follows: Bessemer, $11.90@$12, Valley furnace; basic, $11.75@11.90, Valley; foundry No. 2, $12.65@$12.85, Pittsburg; gray forge, $11.85@$12, Pittsburg.

Steel.—The reduction in prices of billets, sheet-bars and merchant steel bars has not resulted in increased sales, but indications point to a heavy demand before many days. Bessemer and open-hearth billets are quoted at $19.50 and sheet-bars at $21.50, f.o.b. Pittsburg, with freight added to destination. Bessemer steel bars are quoted at 1.30c. and open-hearth at 1.35c. Plates are firm at 1.30c. for 24-in. and narrower and 1.40c. for 24-in. up to 100-in. width.

Sheets.—The sheet trade has not been materially affected by the cut in prices of sheet bars. Black sheets, No. 28 gauge, are still quoted at 2.10c. and galvanized at 3.10@3.15c.

Ferro-Manganese.—The leading interest continues to quote 80% domestic at $41.50 per ton.

Cartagena, Spain. Sept. 10.

(Special Report of Barrington & Holt.)

Iron and Manganiferous Ores.—Shipments for the week were two cargoes, 4,850 tons dry ore, to Great Britain. The ore market locally is very dull, and, to make matters worse, freight rates are high and tonnage scarce.

Quotations for iron ores are as follows, per ton, f. o. b. Cartagena. Ordinary 50% ore,, 6s.@6s. 3d.; special low phosphorus, 6s. 6d@ 7s. 3d.; specular ore, 58%, 8s. 6d.; magnetic ore, 60%, 10s. 9d. for lumps and 9s. for smalls. For manganiferous ores, quotations vary from 9s. 3d. for 35% iron and 12% manganese, up to 14s. for 20% iron and 20% manganese.

Pyrite.—Iron pyrite, 40% iron and 43% sulphur, is quoted at 10s. per ton, f. o. b. Cartagena. No shipments for the week.

CHEMICALS AND MINERALS.

New York, Sept. 28.

Heavy chemicals are hardening in price, and the inquiries received for future delivery indicate that profits will be larger next year. The continued good export demand for acetate of lime coupled with an increasing domestic consumption has favored another advance to $1.875@$1.90 per 100 lb. for gray, but brown is stationary at $1.25@$1.30, being in better supply. The salt trade is again witnessing keen competition, as the reorganized combination has cut prices almost to the bone for the purpose, it is said, of bringing into line certain independent producers. Another trust that is expanding is the E. I. Du Pont de Nemours Powder Co., which has obtained control of the Chattanooga Powder Co., in Tennessee, for a reported sum of $1,000,000, principally in shares, and is negotiating for the Eastern Dynamite Company.

Canadian corundum has been reduced in price in accordance with the installation of a new mill at Craigmont, Ontario, and an increased output. The quotation to-day is 5.5@ 6.5c. per lb., f. o. b. Craigmont, Ontario.

Cyanide.—The market continues quiet at 18@19c. per pound.

Bleaching Powder.—Contracts are reported booked for 1905 delivery on the basis of $1.25 for prime brands. Prompt business is small, and entirely in the hands of jobbers.

Copper Sulphate.—Firm at $4.75@$5 per 100 pounds. Purchases as a rule are small in volume.

Acids.—Aside from a few 1905 contracts for muriatic and sulphuric acid on basis of quotations below, business is generally quiet.

We quote as below per 100 lb., unless otherwise specified, for large lots in carboys or bulk ore (tank cars), delivered in New York and vicinity:

Muriatic, 18°	$1.50	Oxalic, com'l	$5.00@$5.25
Muriatic, 20°	1.60	Sulphuric, 50°	
Muriatic, 22°	1.75	bulk, ton.	13.50@14.50
Nitric, 36°	4.50	Sulphuric, 60°	1.05
Nitric, 38°	4.75	bulk, ton.	18.00@20.00
Nitric, 40°	5.00	Sulphuric, 66°	1.20
Nitric, 42°	5.50	bulk, ton.	21.00@23.00

Brimstone.—Interest is growing in the American enterprise to compete with the Sicilian combination. Prices for foreign best unmixed seconds for shipment are $21.50 per ton, and for best thirds from 50@75c. less. Domestic seconds are offered at $21.35, f. o. b. New York and Portland, and $21.45, f. o. b. Baltimore and Philadelphia, and 99.5% quality at $21.65, f. o. b. New York and Portland, and $21.75, f. o. b. Baltimore and Philadelphia. Sales of domestic so far this month amount to 27,000 tons, of which 4,500 tons are for export.

Pyrite.—Business is pretty good for this season, and orders taken do not show much change in price. Importers of Spanish pyrite are chartering vessel room from Huelva to Atlantic ports on the basis of 10s. Spanish ore, carrying from 46@52% sulphur, is quoted at 10@12c. per unit for lump, and 9@10c. for fines of good quality, f. o. b. Atlantic ports. Domestic lump ore is priced at $5 per ton, f. o. b. shipping port, while fines are worth 8.5 @9c. per unit, the sulphur content varying from 42@44 per cent.

Nitrate of Soda.—Higher prices on the coast, and the reported strike at the Tocapilla oficinas, have greatly strengthened the market here. Belief that the visible supply will be smaller should the labor troubles in Chile continue, has prompted importers to hold for a further advance in price. Consequently current quotations for any position up to June, 1905, are nominal at $2.225@$2.25 per 100 pounds.

Chilean Nitrate of Soda Market.—Messrs. Jackson Bros., of Valparaiso, write under date of August 20 that exporters have shown no disposition to operate during the fortnight, and the little business done has been principally to provide cargoes for vessels arrived and previously chartered. Alongside 2s. 8d. was paid for some few parcels of 95% August-September delivery. Later the same price was accepted for August-September 96%, and subsequently again paid for 95%. A little more business might have taken place, but for the fact that

producers, no sooner the slightest demand is shown, immediately raise their pretensions. The refined quality continues to be neglected for the United States. The market closes quiet with sellers of 95% August-September 7s. 8½d., October-December 7s. 8d., and 96% September-October 7s. 9d., all alongside terms. The price of 7s. 8½d., with an all round freight of 16s. 3d., stands in 9s. 4½d. per cwt. net cost and freight, without purchasing commission.

Sulphate of Ammonia.—Quiet but firm. Gas liquor stands at $2.975@$3 per 100 lb. for prompt delivery, and $3.02@$3.05 for futures.

Phosphates.—Deliveries are seasonably good, and the unanimous opinion that future business will not be done at lower prices has given new hope to sellers who in 1903 realized a deficit. Certainly the visible supply of high-grade phosphates is limited, very small in some directions, and the higher cost of producing makes it imperative for miners to demand an advance in market prices. Consumption continues to increase, and is establishing a new high record. The ocean freight market has strengthened all round. From Florida ports the schedule is $3@$3.24 per ton to Great Britain, and $3.72 to the Baltic. From Coosaw, S. C., $2.88 is named to Great Britain. From Sfax, Tunis, the rates are $2.28 to Baltic ports; $1.92 to Continental, and $1.92@$2.04 to Great Britain. Algerian exporters are paying $1.50 to the United Kingdom.

Reports from abroad intimate that the Algerian and Tunis phosphate miners are uneasy, as the former are suffering from severe competition with the latter. A step forward has been taken by the Dyr Co. to meet this competition by curtailing its output in Algeria and developing its new deposit at Kalaa-es-Senam, in Tunis. Heretofore the Gafsa and the Italian companies have had a monopoly in Tunis, but the entrance of the Dyr Co. will make three formidable competitors for Algeria to contend with. Then who can tell to whom the Tunis government will grant the concession to the new deposit at Moulares?

Phosphates.	F. o. b.	C. i. f. Gt. Britain or Europe.
*Fla., hard rock, 77@80%	$7.25@$7.50	$10.86@11.85
land pebble, 68@73%	3.75@ 4.00	7.70@ 8.40
†Tenn., 78@80%	4.00@ 4.25	10.27@10.67
78%	3.75@ 4.00	.....
75%	3.25@ 3.50	.....
‡So. Car. land rock	3.25@ 3.50	.....
river rock, 55@60%	3.00@ 3.25	6.33@ 6.56
Algerian, 63@70%	.....	6.93@ 7.59
58@63%	.....	6.15@ 6.60
53@58%	.....	5.05@ 5.20
Tunis (Gafsa)	.....	6.33@ 6.50
Christmas Isle, 80@85%	.....	13.20@14.03
Ocean Isle, 82@88%	.....	13.60@14.45
Somme, Fr., 70@75%	.....	10.63@11.02
Bordeaux, Fr., 60@65%	.....	7.60@ 7.72
55@60%	.....	6.44@ 6.55
Liege, Bel., 60@65%	.....	7.00@ 7.10

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel, Ashley River, S. C.

Liverpool. Sept. 20.

(*Special Report of Joseph P. Brunner & Co.*)

There is a quiet but steady trade passing in heavy chemicals. Soda ash is well controlled by makers. For tierces, nearest range is about as follows: Leblanc ash, 48%, £5@ £5 10s.; 58%, £5 10s.@£6 per ton, net cash. Ammonia ash, 48%, £4 5s.@£4 10s.; 58%, £4 10s.@£4 15s. Bags, 5s. per ton under price for tierces. Soda crystals are in request at £3 7s. 6d. per ton, less 5% for barrels, or 7s. less for bags, with special terms for a few favored markets. Caustic soda prices are steady, as follows: 60%, £8 15s.; 70%, £9 15s.; 74%, £10 5s.; 76%, £10 10s. per ton, net cash. Special quotations for the Continent and a few other export quarters. Bleaching powder is well maintained at £4 15s.@£5 per ton, net cash, for hardwood packages, as to market.

Chlorate of potash is held for 3@3¼d. per lb., net cash, as to quantity and market.

Bicarbonate of soda receives a fair amount of attention from buyers, and is steady at £6 15s. per ton, less 2½% for the finest quality in 1 cwt. kegs, with usual allowances for larger packages; also special terms for a few favored markets.

Sulphate of ammonia a shade dearer at £12 3s. 9d.@£12 5s. per ton, less 2½% for good gray, 24@25% in double bags f. o. b. here, as to quality.

Nitrate of soda is without special feature, sellers still holding spot for £10 5s.@£10 10s. per ton, less 2½% for double bags f. o. b. here, as to quality.

METAL MARKET.

New York, Sept. 28.

Gold and Silver Exports and Imports

At all United States Ports in August and Year.

Metal.	August.		Year.	
	1903.	1904.	1903.	1904.
Gold:				
Exports	$84,776	$10,762,818	$40,538,775	$80,295,460
Imports	7,848,553	7,761,371	26,455,814	64,450,515
Excess	I. $7,763,777	E. $3,001,447	E. 14,082,961	E$15,844,945
Silver:				
Exports	2,019,655	4,848,932	22,540,420	35,751,145
Imports	2,368,519	2,513,550	14,914,030	17,670,167
Excess	I. $348,864	E. $2,335,382	E. $7,626,390	E$18,080,978

These exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, New York.

For the week ending September 24 and for years from January 1st.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$4.500	$28,737	$446,056	$27,019
1904	72,938,564	3,882,636	28,686,578	692,450
1903	31,416,903	6,324,730	21,668,787	2,938,638
1902	24,520,118	1,813,392	18,731,643	924,218

Excepting for the usual silver shipments to London, the specie movement this week has been small.

As is not unusual at this time of year, the balance of exchange has turned, and there is some talk of gold imports. In fact, a small shipment—$500,000—has already been made. No large movement seems probable just yet.

The statement of the New York banks—including the 56 banks represented in the Clearing House—for the week ending September 24, gives the following totals, comparisons being made with the corresponding week of 1903:

	1903.	1904.
Loans and discounts	$917,047,700	$1,138,504,800
Deposits	901,345,200	1,214,083,100
Circulation	45,686,500	40,719,200
Specie	168,085,800	251,967,500
Legal tenders	71,819,800	77,804,300
Total reserve	$239,905,600	$329,771,800
Legal requirements	225,336,300	303,520,775
Balance surplus	$14,569,300	$26,251,025

Changes for the week this year were an increase of $611,900 in circulation; decreases of $2,454,000 in loans and discounts, $10,123,500 in deposits, $5,054,700 in specie, $578,300 in legal tenders, and $3,102,125 in surplus reserve.

The following table shows the specie holdings of the leading banks of the world at the latest dates covered by their reports. The amounts are reduced to dollars, and comparison is made with the holdings at the corresponding date last year:

	1903.		1904.	
	Gold.	Silver.	Gold.	Silver.
N. Y. Ass'n.	$168,085,800	.....	$251,967,500	.....
England	172,224,935	.....	191,951,710	.....
France	501,707,600	$223,777,540	530,375,615	$222,404,560
Germany	179,830,000	63,185,000	169,195,000	59,445,000
Spain	73,280,000	99,500,000	73,910,000	102,170,000
Netherlands	19,758,000	32,257,000	27,402,000	31,262,500
Belgium	14,873,335	7,436,665	16,143,335	8,072,665
Italy	97,080,000	11,896,000	110,360,000	19,368,000
Russia	416,875,000	41,375,000	476,830,000	42,125,000
Austria	228,970,000	63,095,000	243,125,000	61,755,000

The returns of the Associated Banks of New York are of date September 24, and the others September 22, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

The silver market has continued strong this week on Eastern and Continental buying, but closes with an easier tendency.

The United States Assay Office in New York reports receipts of 72,000 oz. of silver for the week.

Indian exchange has been steady, Council bills offered in London being taken at an average of 16d. per rupee, although the demand was somewhat lighter. Some shipments of gold have been made from India to London, and it is possible that more will come. Demand for silver for Indian account has been rather light.

Prices of Foreign Coins.

	Bid.	Asked
Mexican dollars	$0.45½	$0.47
Peruvian soles and Chinese pesos	.41½	.43
Victoria sovereigns	4.85	4.87
Twenty francs	3.87	3.90
Spanish 25 pesetas	4.78	4.82

OTHER METALS.

Daily Prices of Metals in New York.

September.	Copper. Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cathodes, Cts. per lb.	London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. Per lb.	Spelter. St. Louis, Cts. per lb.
22	12⅜ @12⅝	12⅜ @12⅝	12⅜ @12⅝	58 1/16	27½	4.20	5.05 @5.07½	4.90 @4.92½
23	12⅜ " 12⅝	12⅜ " 12⅝	12⅜ " 12⅝	57 13/16	27½	4.20	5.05 " 5.07½	4.90 "4.92½
24	12⅜ " 12⅝	12⅜ " 12⅝	12⅜ " 12⅝	....	27½	4.20	5.05 " 5.07½	4.90 "4.92½
26	12⅜ " 12⅝	12⅜ " 12⅝	12⅜ " 12⅝	57½	27½	4.20	5.05 " 5.07½	4.90 "4.92½
27	12⅜ " 12⅝	12⅜ " 12⅝	12⅜ " 12⅝	58	28⅛	4.20	5.05 " 5.07½	4.90 "4.92½
28	12⅜ " 12⅝	12⅜ " 12⅝	12⅜ " 12⅝	58⅛	28¼	4.20	5.05 " 5.07½	4.90 "4.92½

London quotations are per long ton (2,240 lb.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wire-bars.

SILVER AND STERLING EXCHANGE.

September	Sterling Exchange.	Silver. New York. Cents.	Silver. London. Pence.	September	Sterling Exchange.	Silver. New York. Cents.	Silver. London. Pence.
22	4.86	57½	26 7/16	26	4.85¾	57⅞	26⅛
23	4.85¾	57⅛	26 7/16	27	4.85¾	58¼	26⅛
24	4.85¾	57⅛	26⅛	28	4.85¾	58	26 1/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver .925 fine.

Copper.—The market has ruled very firm indeed throughout the week, and a fair business has been done both for home trade and export. The closing quotations are given as 12⅝@12¾ for Lake; 12½@12⅝ for electrolytic copper in ingots, cakes and wire bars; 12¼@12⅜ for cathodes; 12¼@12⅜ for casting copper.

The market for standard copper in London, which closed last week at £57 16s. 3d., opened on Monday at £57 17s. 6d., and the closing quotations on Wednesday are cabled as £58 6s. 3d @£58 7s. 6d for spot, £58 7s. 6d.@£58 8s 9d. for three months.

Refined and manufactured sorts we quote: English tough, £60 10s.@£60 15s.; best selected, £61 10s@£61 15s.; strong sheets, £70@£70 10s.; India sheets, £68@£68 10s.; yellow metal, 6⅛@ 6¼d.

Exports of copper from New York and Baltimore for the week ending September 27 were 6,091 long tons, chiefly to Germany and Great Britain. Imports at New York for the week of September 23 were 9 tons of copper and $19,973 worth of ore, of which the quantity is not given.

Tin.—There has been a good consumptive demand, and the market has displayed considerable strength. The closing quotations are given as 28¼ for spot and futures.

The foreign market, which closed last week at £127 5s., opened on Monday at £126 12s. 6d., advanced on Tuesday to £127 10s., and the closing quotations on Wednesday are cabled as £128@£128 1s. 3d. for spot, £128 10s.@£128 11s. 3d. for three months.

Lead.—The market has ruled very firm indeed, but nothing of interest has transpired. There is a good consumptive demand. The closing quotations are given as 4.20 New York, 4.12½ St. Louis.

The foreign market is firm, Spanish lead being quoted at £11 17s. 6d.

St. Louis Lead Market.—The John Wahl Commission Company telegraphs us as follows: Lead is quiet but firm, 4.13½c. being quoted for both Missouri brands and argentiferous lead.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of September 10, that the price of silver during the week has been 14.5c reales per oz. Exchange has been 34.74 pesetas to £1. Local quotation for pig lead has been 65.25 reales per quintal, which, on current exchange, is equal to £10 10s. 2d. per long ton, f. o. b. Cartagena. Exports were 821,667 kg. to London and 276,634 kg. to Marseilles, all argentiferous lead.

Spelter is quiet but firm, without any special feature. Ore prices continue high. The closing quotations are unchanged at 4.90@4.92½ St. Louis, 5.05@5.07½ New York.

The foreign market is easy, good ordinaries being quoted at £22 5s., special at £22 10s.

St. Louis Spelter Market.—The John Wahl Commission Company tellegraphs us as follows: Spelter is rather dull, at about 4.92½c., East St. Louis.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of September 10, that the market continues unchanged, demand being good as for some time past. Quotations for blende, 35% zinc, continue at 67 francs per ton, and calamine 30% zinc, at 47 francs. Shipments for the week were 400 tons blende to Hamburg and 3,200 tons to Antwerp.

Antimony is steady but quiet. We quote: Cookson's, 6¾@7c.; Hallett's, 6⅜@6⅝c.; U. S., French, Hungarian, Japanese, Italian and Chinese, 5⅞@6c.

Nickel.—The price is quoted by leading producers at 40@47c. per lb. for large quantities down to ton lots, according to size and terms of order. The price for smaller lots, according to quantity, runs as high as 60c. per pound.

Platinum.—Quotations are nominally $18.50 per ounce, but the tendency is upward and higher prices are expected.

Platinum in manufactured forms is very firm. Messrs. Eimer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 75c. per gram.; foil and wire, 77c.; crucibles and dishes, 80c.; perforated ware, like cones, etc., 85c. per gram.

Quicksilver.—Prices are low. In New York large lots have been offered at $40 per flask (75 lb.), with $41@$42 quoted for smaller orders. The San Francisco price is now $41.50 @$42. London price is £7 15s., with the same quotation from second-hands.

Minor Metals and Alloys.—Thallium is quoted at 60@65 marks per kg. at Breslau, Germany. Manganese metal is quoted at 360 marks per 100 kg., f. o. b. Bremen, Germany. Manganese tin alloy, 55%, is quoted 365 marks per 100 kg. for first quality and 225 marks for second quality, both f. o. b. Bremen.

For other minor metals and their alloys, wholesale prices, f. o. b. works, are as follows:

Aluminum.	Per lb.		Per lb.
No. 1. 99% ingots	33@37c	Ferro-chrom. (74%)	12¼c.
No. 2. 99% ingots	31@34c	Ferro-Tungsten (37%)	45c.
Rolled Sheets	4c. up	Magnesium, pure (N.Y.	1.60
Alum-bronze	20@23c.	Manganese, 98@99%	
Nickel-alum	33@39c.	(N. Y.)	75c.
Bismuth	$2.10	Manganese, Cu., 30@70%	
Chr'm'm, pure (N.Y.)	80c.	(N. Y.)	40c.
Copper, red oxide	50c.	Molybdenum, 98@99%	
Fe.-Molybd'm (50%)	$1.00	(N. Y.)	$2.75
Ferro-Titanium (10%)	90c.	Phosphorus, foreign	45c.
Ferro-Titanium (20@25%) N. Y.	75c.	Phosphorus, American	70c.
Ferro-Vanadium, 25% (N. Y.)	$3.00	Sodium metal	50c.
		Tungsten (Best)	$1.25

Differences in price depend chiefly upon size and conditions of order.

Missouri Ore Market. Sept. 24.

(From Our Special Correspondent.)

The highest price reported paid for zinc ore was $46 per ton, though there were rumors of one bin selling at $47 per ton. This is an advance of $5 per ton in two weeks. The assay basis price closed the week at $41 to $43 per ton of 60% zinc. A little ore purchased early in the week was obtained on a $40 basis, and some ore purchased last week was loaded the fore part of this week, on a $39 basis. The effort to supply a demand of approximately 6,000 tons per week with an output of approximately 5,000 tons has resulted in cleaning up all the reserve ore in the district and forced buyers to contract largely ahead of the output. It is this situation that has necessitated the continued advances of zinc ore from a top price of $35 and an assay basis of $30@$33 the first week in July, until the present time. There was then about 4,000 tons reserve. To-day there is less than 2,000 tons of ore in the bins, none of which can be classed as reserve because it is all sold for early delivery next week, and unmined ore to the amount of fully 2,000 tons is contracted for.

No change in the price of lead was reported, this ore selling all week at $53.50 per ton.

Following are the shipments of zinc from the various camps of the district for the week, the totals for the week and nine months of the year to date:

	Zinc lb.	Lead lb.	Value.
Webb City-Cartervl	2,568,890	509 370	$63,590
Joplin	2,641,590	151,000	60,830
Duenweg	1,015,000	293,020	28,490
Galena-Empire	850,250	100,790	19,230
Alba-Neck	880,310	.....	18,930
Aurora	533,720	14,990	10,700
Carthage	446,030	.....	9,370
Granby	495,530	57,000	7,880
Sherwood	124,360	59,540	4,380
Prosperity	108,810	53,150	3,990
Oronogo	192,360	5,460	3,780
Badger	169,520	5,500	3,690
Spurgeon	152.020	4,410	2,810
Zincite	126,840	.....	2,660
Beef Branch	102,290	16,400	1,360
Stott City	43,770	.....	920
Totals	10,451,290	1,270,630	$242,610
Nine months	386,719,490	48,702,560	$7,825,240

Zinc value, the week, $208.820; nine months, $6,500,790

Lead value, the week, 33,790; nine months, 1,324,450

The new smelters started during the summer, which, it was given out in advance, would obtain all or a large portion of supplies from the West, have drawn entirely upon this district. Some smelters, thinking doubtless that the price of zinc ore must surely recede, are now finding it necessary to enter the market for increased supplies, and are forced to advance prices, already very strong, in order to obtain any ore. None of the smelters have more than a usual stock on hand at the works, while some are short. At the present quotation of spelter the smelters must lose about $10 per ton to market their metal. As there is no immediate prospect of obtaining an additional supply of ore they must have an additional price for their metal or quit. The conditions are pointing to the nearness of one or the other alternative very soon. If the metal does not advance before the smelters are forced to restrict their output, such a movement might create a stampede among metal buyers and send spelter up as rapidly as ore has advanced.

Average Prices of Metals per lb., New York

Mo.	Tin.		Lead.		Spelter.	
	1903.	1904.	1903.	1904.	1903.	1904.
Jan	28.33	28.845	4.075	4.347	4.865	4.863
Feb	29.43	28.087	4.075	4.375	5.043	4.916
Mar.	30.15	28.317	4.442	4.475	5.349	5.057
April	29.81	28.132	4.567	4.475	5.550	5.219
May	29.51	27.718	4.325	4.423	5.639	5.031
June	28.34	26.325	4.210	4.196	5.697	4.760
July	27.68	26.573	4.075	4.192	5.662	4.873
Aug.	28.29	27.012	4.075	4.111	5.725	4.866
Sept	26.77	.....	4.243	.....	5.686	.....
Oct	25.92	.....	4.375	.....	5.510	.....
Nov.	25.42	.....	4.218	.....	5.038	.....
Dec	27.41	.....	4.162	.....	4.731	.....
Year	28.09	.....	4.237	.....	5.400	.....

NOTE.—The average price of spelter in St. Louis for the month of January, 1904, was 4.673c. per lb.; February, 4.717c.; March, 4.841c.; April, 5.038c.; May, 4.853c.; June, 4.596c.; July, 4.723c.; August, 4.716c.

Average Prices of Copper.

Mo.	New York.				London.	
	Electrolytic.		Lake.		Standard.	
	1903.	1904.	1903.	1904.	1903.	1904.
Jan	12.159	12.410	12.361	12.553	53.52	57.55
Feb.	12.778	12.063	12.901	12.245	57.34	56.57
Mar.	14.416	12.299	14.572	12.551	63.85	57.321
April	14.454	12.923	14.642	13.120	61.72	58.247
May	14.435	12.758	14.618	13.000	61.73	57.321
June	13.942	12.269	14.212	12.399	57.30	56.398
July	13.094	12.380	13.341	12.505	56.64	57.256
Aug.	12.962	12.343	13.159	12.468	58.44	56.952
Sept	13.205	.....	13.345	.....	56 82	.....
Oct	12.801	.....	12.954	.....	55.60	.....
Nov.	12,617	.....	12.813	.....	56.30	.....
Dec	11,952	.....	12,084	.....	56.36	.....
Year	13.235	.....	13.417	.....	57.97	.....

New York prices are in cents, per pound; London prices in pound sterling, per long ton of 2,240 lbs., standard copper. The prices for electrolytic copper are for cakes, ingots or wire bars; prices of cathodes are usually 0.25 cent. lower.

Average Prices of Silver, per ounce Troy.

Mo.	1902.		1903.		1904.	
	London, Pence.	N. Y., Cents.	London, Pence.	N. Y., Cents.	London, Pence.	N. Y., Cents.
Jan	25.62	55.56	21.98	47.57	26.423	57.055
Feb	25.41	55.09	22.11	47.89	26.665	57.592
Mar.	25.00	54.23	22.49	48.72	26.164	56.741
April.	24.34	52.72	23.38	50.56	24.974	54.202
May	23.71	51.31	24.89	54.11	25.578	55.430
June	24.17	52.36	24.29	52.86	25.644	55 673
July	24.38	52.88	24.86	53.92	26.760	58.095
Aug.	24.23	52.52	25.63	55.36	26.591	57.806
Sept	23.88	51.52	26.75	58.00	.....	.....
Oct	23.40	50.57	27.89	60.36	.....	.....
Nov.	22.70	49.07	27.01	58.11	.....	.....
Dec	22.21	48.03	25.73	55.375	.....	.....
Year	24.09	52.16	24.75	53.57	.....	.....

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

DIVIDENDS.

Company.	—Latest Dividend.— Payable.	Rate.	Total.	Total to date.
†Am.Sm.&Ref.com.	Oct. 25	$1.25	$625.000	$2,500,000
†Am.Sm.&Ref., pf.	Oct. 11	1.75	875.000	15,891,553
†CentralC.&C.,com.	Oct. 15	1.50	76,875	858,750
†Central C. & C.,pf.	Oct. 15	1.25	23,437	890,620
†Gen'l Chem., pf	Oct. 1	1.50	150,000	3,175,178
Greene Con. Copper.	Oct. 28	.30	259,200	1,429,420
†Guggenheim Expl.	Oct. 11	1.75	183,750	1,286,250
Horn Silver, Utah.	Sept. 30	.05	20,000	5,422,000
Iron Silver, Colo.	Oct. 31	.10	50.000	3,100,000
New Idria, Cal.	Oct. 1	.30	30,000	670,000
†Phila.Nat.Gas.com.	Nov. 1	.75	398,888	5,012,383
†Sloss-Sheffield,pf.	Oct. 1	1.75	117.250	2,205.000
†Tex. & Pac. Coal.	Oct. 1	1.50	30,000	1,890,000
†Va. Car Chem., pf.	Oct. 15	2.00	360,000	8,220,868
Wolverine, Mich.	Oct. 1	4.00	240,000	1,770,000

*Monthly. †Quarterly.

ASSESSMENTS.

Company.	Delinquent.	Sale.	Amount.
Alpha Con., Nev	Oct. 3	Oct. 24	$0.05
Belcher, Nev.	Sept. 13	Oct. 4	.10
Confidence, Nev	Sept. 19	Oct. 7	.20
Con. New York, Nev	Sept. 13	Oct. 4	.05
Marina Marsicano, Cal.	Sept. 29	Oct. 31	.05
Mexican, Nev.	Sept. 12	Oct. 3	.15
Mohican, Cal.	Oct. 15	.....	.10
New Montezuma, Cal.	Oct. 12	.....	.02
Orleans Con., Cal.	Sept. 15	Oct. 31	.07
Savage, Nev.	Oct. 5	Oct. 26	.10
South Columbus, Utah	Sept. 23	Oct. 12	.01
White Pine, Copper, Nev.	Oct. 21	.....	.20
Yellow Jacket, Nev	Sept. 22	Oct. 27	10

STOCK QUOTATIONS

NEW YORK.

Company.	Par val.	Sept. 21 H.	Sept. 21 L.	Sept. 22 H.	Sept. 22 L.	Sept. 23 H.	Sept. 23 L.	Sept. 24 H.	Sept. 24 L.	Sept. 26 H.	Sept. 26 L.	Sept. 27 H.	Sept. 27 L.	Sales.
Amalgamated	100	58⅜	57½	58	57⅛	58	57⅛	58	57⅜	58⅜	57⅛	58½	52	87,638
Anaconda C	25	95½	93½	93	90⅛	91	90⅜	94	....	93½	93	94	....	4,380
Anaconda, G	5	....	....	....	....	....	....	....	....	....	....	....	....	....
Belcher	1	....	....	....	....	....	....	....	....	....	....	30	....	300
Best & Belcher	3	....	....	....	....	....	....	....	....	....	....	....	....	....
Brunswick	1	....	....	....	....	13	....	....	....	12	....	....	....	400
Caledonia	1	....	....	....	....	....	....	....	....	....	....	62	....	200
Challenge	2½	....	....	19	....	....	....	....	....	....	....	....	....	200
Chollar	2½	....	....	....	....	....	....	....	....	....	....	23	....	700
Chrysolite	50	....	....	04	....	....	....	....	....	....	....	05	....	800
C. K. & N	1	20	....	20	....	....	....	....	....	....	....	....	....	1,500
Con. Cal. & Va	3	105	....	....	....	....	....	115	....	105	....	....	....	350
Con. Imperial	2½	....	....	....	....	01½	....	....	....	....	....	....	....	500
Cripple Creek Con.	1	....	....	....	....	....	....	....	....	....	....	09	....	500
Crown Point	1	....	....	....	....	....	....	....	....	13	12	....	....	600
Elkton	1	63	....	....	....	....	....	....	....	60	....	....	....	550
El Paso	1	....	....	....	....	....	....	....	....	....	....	....	....	....
Gold Dollar	1	....	....	....	....	....	....	19	....	....	....	....	....	1,000
Greene Con	10	16	15⅛	16	15⅛	16⅛	16	16	....	18	16⅛	18⅛	17⅛	44,312
Hale & Norcross	3	58	....	....	....	....	....	....	....	63	62	64	63	800
Homestake	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Horn Silver	20	165	....	....	....	....	....	....	....	....	....	....	....	125
Iron Silver	20	....	....	175	....	....	....	....	....	....	....	....	....	330
Isabella	1	21	....	....	....	19	....	....	....	....	....	....	....	2,400
Jack Pot	1	....	....	04½	....	....	....	....	....	....	....	....	....	500
Little Chief	50	....	....	....	....	....	....	....	....	....	....	....	....	....
Mollie Gibson	5	....	....	....	....	04	....	....	....	....	....	....	....	1,000
Moon Anchor	3	....	....	....	....	....	....	08	07	07	....	....	....	1,500
Moulton	25	....	....	....	....	....	....	....	....	....	....	....	....	....
Occidental	3	....	....	....	....	83	....	....	....	....	....	....	....	100
Old Gold g	1	....	....	....	....	....	....	....	....	....	....	....	....	....
Ontario	100	....	....	....	....	....	....	....	....	400	....	....	....	10
Ophir	5	....	....	230	....	230	....	....	....	235	....	235	....	400
Overman	2	....	....	21	....	....	....	20	19	....	....	....	....	800
Pharmacist	1	....	....	03	....	03	....	....	....	03	....	....	....	3,000
Phoenix	1	....	....	18	....	....	....	18	17	....	....	....	....	2,500
Portland	1	....	....	....	....	165	....	160	....	....	....	160	155	600
Potosi	1	....	....	....	....	....	....	....	....	14	....	....	....	100
Savage	3	19	....	....	....	....	....	....	....	....	....	....	....	200
Sierra Nevada	3	31	30	30	....	32	....	....	....	....	....	....	....	800
Small Hopes	20	....	....	....	....	....	....	....	....	....	....	35	....	100
Standard Con	10	....	....	....	....	....	....	....	....	....	....	200	....	100
Tennessee	25	33½	33½	33½	33	33	32½	....	....	32½	31½	....	....	1,500
Union Con	1	40	39	....	....	....	....	39	....	40	....	....	....	650
Union Copper	10	....	....	1	....	....	....	....	....	1	15/16	....	....	200
United Cp. Com.	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Utah	1	....	....	....	....	....	....	....	....	10	....	....	....	300
White Knob	10	4	....	4½	4½	....	....	4	3½	3½	3½	3½	3	2,035
Work	1	....	....	....	....	....	....	10	....	....	....	09	....	1,300
Yellow Jacket	1	....	....	....	....	26	....	....	....	....	....	....	....	200

Total sales, 165,680 shares.

COAL, IRON AND INDUSTRIAL STOCKS.

Company.	Par val.	Sept. 21 H.	Sept. 21 L.	Sept. 22 H.	Sept. 22 L.	Sept. 23 H.	Sept. 23 L.	Sept. 24 H.	Sept. 24 L.	Sept. 26 H.	Sept. 26 L.	Sept. 27 H.	Sept. 27 L.	Sales.
Allis-Chalmers	$100	....	....	....	....	....	....	....	....	....	....	....	....	....
Preferred	100	....	....	....	....	....	....	....	....	....	....	50	....	100
Am. Agr. Chem	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Preferred	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Am. Sm. & Ref.	100	65	64⅛	64½	64⅛	66½	64⅛	67⅛	66½	67½	67	67½	67	25,220
Preferred	100	107	....	107	106½	108	106½	108	107½	109½	108	109½	109½	4,815
Col. Fuel & I	100	34	33½	34½	....	....	....	35	....	35	34½	35½	34½	2,410
Preferred	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Col. & H. C. & I	100	13	12⅛	12⅛	12½	12½	12½	12½	12⅛	13	....	13	....	1,210
Crucible Steel	100	6⅛	....	6⅛	....	6⅛	6⅛	6⅛	6½	6½	6⅛	6⅛	6⅛	2,420
Preferred	100	39½	38½	38⅛	....	39⅛	38⅛	39	....	39⅛	39	41	40½	2,170
General Chemical	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Preferred	100	95	....	....	....	95½	....	....	....	....	....	....	....	300
Mong. R. Coal	50	....	....	....	....	....	....	....	....	....	....	....	....	....
Preferred	50	21½	....	21	....	22	....	....	....	....	....	20½	20½	170
National Lead	100	23⅛	23⅛	23½	....	23⅛	23½	24	23⅛	23⅛	....	24⅛	23½	5,825
Preferred	100	....	....	96½	....	96½	....	....	....	....	....	94⅛	....	143
Phila. Nat. Gas.	100	....	....	....	....	....	....	....	....	42½	....	43	....	70
Preferred	100	....	....	....	....	....	....	....	....	45	....	45½	45	600
Pittsburg Coal	100	....	....	....	....	....	....	....	....	14	....	13⅜	....	40
Preferred	100	61½	....	61	60½	61½	61	61½	61	62	60½	61½	61	1,207
Republic I. & S	100	8½	....	8⅛	8½	8½	....	....	....	9	8½	9	8½	4,675
Preferred	100	43½	43⅛	43½	43½	43½	....	....	....	45	43½	45	44½	2,613
Sloss-Shef. S & I	100	....	....	39	....	....	....	....	....	40½	40	40½	40	900
Preferred	100	....	....	....	....	....	....	88½	....	....	....	....	....	100
Standard Oil	100	....	....	645	641	642	639	....	....	640½	640	640	....	84
Tenn. C. I. & R.R.	100	46½	46	46⅞	46	47½	46½	47⅛	47	47⅞	47⅛	48⅛	47⅛	8,710
U. S. Steel Corp	100	16⅛	16⅛	16⅛	16	16⅛	16	17⅛	16⅛	18⅛	17⅛	18⅛	17⅛	186,830
Preferred	100	67⅛	66	67½	66½	67½	66⅞	68⅛	67½	70	68⅞	70⅛	69⅛	393,651
Va.-Car Chem	100	35	34½	35	34½	34½	34½	34½	....	34½	....	35½	34½	2,535
Preferred	100	108½	107½	108½	108	107½	107	107½	....	107½	107½	108½	107½	4,735

*Pittsburg Exchange; all others, New York Stock Exchange. Total sales, 651,533 shares.

SAN FRANCISCO.*

Company.	Location.	Sept. 15 H.	Sept. 15 L.	Sept. 16 H.	Sept. 16 L.	Sept. 17 H.	Sept. 17 L.	Sept. 19 H.	Sept. 19 L.	Sept. 20 H.	Sept. 20 L.	Sept. 21 H.	Sept. 21 L.	Sales.
Golden Anchor	Nev.	....	....	....	....	....	....	....	....	....	....	....	....	....
MacNamara	Nev	.35	.34	.34	.33	.37	.34	.43	.39	.42	.41	.40	.37	61,350
Mont. Tonopah	Nev	1.65	1.60	1.80	1.65	187½	1.85	2.00	1.90	2.15	2.00	202½	2.00	8,390
Ton. Belmont	Nev	.57	.55	....	....	....	....	....	....	.57	.55	....	....	3,400
Ton. Midway	Nev	....	....	.39	....	.40	....	.39	.38	.39	....	.38	....	3,400
Ton. Mg. Co	Nev	8.00	787½	8.00	....	8.00	....	....	....	8.00	....	....	....	960
Ton. North Star	Nev	.18	....	.19	.18	....	....	.25	....	....	....	.25	....	4,800

*San Francisco & Tonopah Exchange. Total sales, 82,300 shares.

SAN FRANCISCO (By Telegraph.)

Company	September 26	September 27	Company	September 26	September 27
Belcher	$0.31	$0.32	Gould & Curry	$0.22	$0.24
Best & Belcher	1.10	1.15	Hale & Norcross	.64	.64
Caledonia	.61	.62	Mexican	1.00	1.10
Challenge Con	.19	.20	Ophir	2.30	2.35
Chollar	.21	.19	Overman	.19	.19
Confidence	.75	.90	Sierra Nevada	.32	.35
Con. California & Virginia	1.10	1.25	Union Con	.40	.45
Crown Point	.14	.14	Yellow Jacket	.24	.24

BOSTON, MASS.

Company.	Par val.	Sept. 21 H.	Sept. 21 L.	Sept. 22 H.	Sept. 22 L.	Sept. 23 H.	Sept. 23 L.	Sept. 24 H.	Sept. 24 L.	Sept. 26 H.	Sept. 26 L.	Sept. 27 H.	Sept. 27 L.	Sales.
Adventure Con	$25	2½	2⅜	2½	....	2⅜	....	3½	2⅜	3⅜	3½	3⅜	3½	3,101
†Allouez	25	11⅝	....	12	11⅜	12½	11⅜	13	12	15⅜	14½	15⅜	15½	7,824
Amalgamated	100	58⅛	57½	58	57⅛	57½	57⅛	58	57⅛	58⅜	57⅛	58⅜	58	8,983
American Zinc	25	....	....	....	....	....	....	....	....	....	....	....	....	....
Anaconda	25	....	....	22½	22⅜	....	....	....	....	....	....	....	....	70
Arcadian	25	1	....	....	....	90	....	....	....	1	....	1⅛	1	290
Atlantic	25	....	....	12⅜	12½	13	12⅜	14	13	14½	14	14	13½	2,830
Bingham Con	50	....	....	....	....	26½	....	26½	....	26⅜	26½	26⅜	26½	1,177
Bonanza	10	.47½	....	....	....	.47½	....	....	....	....	....	.47½	....	600
Boston Con	5	6⅜	....	....	....	6⅜	....	6½	....	6⅜	6⅜	6⅜	....	630
Calumet & Hecla	25	510	....	....	....	505	....	505	....	515	505	5.0	515	45
Catalpa	10	....	....	....	....	....	....	....	....	....	....	....	....	....
Centennial	25	....	....	27½	26½	27½	26½	27	....	28	27	27½	....	1,040
Central Oil	25	....	....	....	....	....	....	....	....	....	....	....	....	....
Con. Mercur	5	....	....	....	....	30	....	....	....	30	....	....	....	525
Cont. Zinc	25	....	....	....	....	....	....	....	....	....	....	....	....	....
Copper Range	100	57½	56½	57	56½	57½	56½	57⅜	57	58⅛	57	57½	57⅛	4,531
Daly-West	20	14	....	14½	13⅜	14⅜	....	....	....	14½	....	14½	....	309
Dominion Coal	100	58	....	....	....	59	58½	....	....	59	58	....	....	210
Preferred	100	109	108½	....	....	....	....	....	....	....	....	....	....	4
Dominion I.& S	100	11½	....	....	....	....	....	....	....	11½	....	12½	12½	740
Elm River	12	....	....	2½	2	....	....	....	....	....	....	....	....	100
Franklin	25	8½	....	8	..	7½	7⅜	8	....	8½	8	....	....	465
Granby Con	10	3	....	3½	....	....	....	....	....	3⅜	3 1/16	....	....	7,450
Guanajuato Con	5	....	....	1⅜	....	1½	....	1½	1½	1⅜	1⅜	1⅜	1½	2,365
Isle Royal Con	25	18½	17⅜	18½	18	20	18½	21½	20	22½	21½	22½	20⅜	14,096
Mass Con	25	....	....	4⅜	4⅜	4⅜	....	....	....	4½	....	4⅜	4½	505
Mayflower	25	50	....	50	45	....	....	....	....	....	....	50c	....	540
Michigan	25	....	....	....	....	....	....	6	....	....	....	6½	....	250
Mohawk	25	45½	....	....	....	45½	45	45½	....	46½	45½	46	45½	627
Mont. Coal & C	25	5½	....	5½	5	....	....	....	....	....	....	....	....	390
Mont. & Boston	5	....	....	....	....	....	....	....	....	1	....	....	....	50
New Idria, Q'sil	5	....	....	....	....	....	....	....	....	....	....	....	....	....
Old Colony	25	....	....	....	....	....	....	....	....	....	....	....	....	....
Old Dominion	25	....	....	15	....	....	....	15	....	17	15½	17½	17	2,565
Osceola	25	78	....	78	77½	77½	76½	78½	77	82½	79½	81½	81	1,672
Parrot	10	....	....	24½	....	23½	....	....	....	....	....	....	....	101
Phœnix Con	25	2½	....	2½	....	....	....	....	....	2½	2	....	....	550
Quincy	25	92	....	91	....	....	....	90½	....	91	90	91	....	86
Rhode Island	25	....	....	....	....	....	....	....	....	....	....	80	....	100
Santa Fe	10	1⅛	....	....	....	....	....	....	....	....	....	1⅛	....	300
Shannon	10	4	3⅞	4	3⅞	4	3⅞	4⅛	4	4½	4½	4½	4	6,240
Tamarack	25	116	....	116	114	114	....	115	....	....	....	115	....	67
Tecumseh	25	....	....	....	....	....	....	....	....	....	....	....	....	....
Trinity	25	7	....	7	....	....	....	7	6½	7½	7⅛	8½	7	5,977
Union Coal	....	....	....	....	....	....	....	....	....	....	....	....	....	....
United States	10	20⅛	19½	20½	19½	20½	19½	20⅜	20	20½	20½	21	20⅜	7,831
U.S.Coal & Oil	25	....	....	11	....	11	....	....	....	11	....	11⅜	11	489
Utah Con	5	40⅜	39½	40½	40	40½	....	40⅜	40½	41½	40	41½	40½	5,940
Victoria	25	4½	3½	4	3½	4	3½	4½	4	4½	4½	4½	4	1,027
Winona	25	....	....	....	....	9½	8½	9½	9⅜	9⅜	9	9	....	1,070
Wolverine	25	87	....	....	....	86	....	86½	85	88⅝	86½	89	....	538
Wyandot	25	.75	.70	.75	.70	.75	.70	.75	.70	.80	.70	.75c	....	2,713

*Ex-dividend. †Assessment paid. Total sales, 96,993 shares.

COLORADO SPRINGS, COLO.

Company.	Par val.	Sept. 17 H.	Sept. 17 L.	Sept. 19 H.	Sept. 19 L.	Sept. 20 H.	Sept. 20 L.	Sept. 21 H.	Sept. 21 L.	Sept. 22 H.	Sept. 22 L.	Sept 23 H.	Sept 23 L.	Sales.
Acacia	$1	.06½	.06½	.06½	.06	.06½	.06	.06½	.06	.06½	.06	.06½	.05½	3,500
Anaconda	5	.11½	.10	.10	....	.11½	....	.11½	.10	.11½	.10	.11½	....	1,000
Colo. City & M	1	.01½	.007	.007	....	.007	....	.007	....	.01½	.007	.01½	.007	....
C. K. & N	1	.29	.22	.30	.22	.27	.21	.21	.15	.23	....	.25	.15	1,000
Cripple Ck. Con	1	.09	.08½	.09	.08½	.08½	.08½	.08½	.08½	.08½	.08½	.09	.08	....
Des Moines	1	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	....
Doctor-Jack Pot	1	.04½	.04½	.04½	.04½	.04½	.04½	.04½	.04½	.04½	.04½	.04½	.04½	20,000
Elkton Con	1	.65	.64	.64½	.64	.64½	.63½	.68	.62½	.61½	....	.61½	.60½	7,600
El Paso	1	.96	.95½	.95½	.94½	.95	.94½	.95	.94½	.94½	.94½	.95	.94½	13,922
Gold Dollar Con	1	.07½	.07	.07½	.06½	.07	.06½	.06½	.06½	.06½	.06½	.06	.05½	11,200
Gold Sovereign	1	.05½	.05½	.05½	.05½	.05½	.05½	.05½	.05½	.05½	.05½	.05½	.05½	3,000
Golden Cycle	1	.45	.40	.45	.40	.45	.40	.45	.40	.45	.40	.45	.40	....
Hart	1	.03	.02	.03	.02	.04	.02	.04	.02	.04	.02	.03	.02	....
Isabella	1	.20½	.19½	.20½	.19½	.21½	.19	.20½	.19	.20	.15	.20	....	6,000
Jack Pot	1	.05	.03½	.04½	.03½	.04½	.03½	.05	.03½	.04½	.03½	.05	.03½	1,000
Keystone	1	.05	.04	.04½	.04½	.04½	.04½	.04½	.04½	.04½	.04½	.04½	.04½	....
Last Dollar	1	.40	....	.40	....	.40	....	.40	....	.25	.15	.25	.15	....
Lexington	1	.03½	.03½	.03½	.03½	.03½	.03½	.03½	.03½	.03½	.03½	.03½	.03½	....
Little Puck	1	.03½	.03½	.04	.03½	.04	.03½	.04	.03½	.03½	.03½	.03½	.03½	....
Mollie Gibson	1	.04½	....	.04½	....	.04½	....	.04½	.03	.04½	....	.04½	....	....
Moon-Anchor	5	.07½	.06	.07½	.06½	.07½	.06	.07	.06½	.07	.06½	.07½	.06	....
New Haven	5	.03½	.03	.03½	.03	.03½	.03½	.03½	.03½	.03½	.03½	.03½	.03½	2,000
Old Gold	1	.10	.09½	.10	.09½	.09½	.09½	.09½	.09½	.09½	.09½	.11	.10	7,000
Pharmacist	1	.03½	.03	.03½	.03½	.03½	.03	.03½	.03½	.03½	.03	.03	....	....
Portland	1	1.65	1.60	1.65	1.60	1.65	1.55	1.65	....	1.65	....	1.65	....	300
Vindicator Con	1	.68	.62	.68	.62	.68	.62	.68	.62	.68	.62	.68	.62	....
Work	1	.08½	.08½	.09	.08½	.08½	.08½	.08½	.08½	.08½	.08½	.08	....	....

Total Sales, 77,522 shares.

COLORADO SPRINGS (By Telegraph.)

Company.	Sept. 26 H.	Sept. 26 L.	Sept. 27 H.	Sept. 27 L.	Company.	Sept. 26 H.	Sept. 26 L.	Sept. 27 H.	Sept. 27 L.
Anaconda	.11½	....	.11½	.10	Jack Pot	.05	.03½	....	....
Cripple Ck. Con	.09	.08½	.09	.08½	Last Dollar	.25	.15	....	....
C. K. & N	....	....	.21½	.20	Mollie Gibson	.04½	....	.04½	.03½
Doctor Jack Pot	.04½	.04½	....	....	Moon Anchor	.07½	.06½	.07½	.06½
Elkton Con	.61	.60½	.61	.60½	Old Gold	....	....	.11½	.11½
El Paso	.95½	.95½	.96	.95½	Pharmacist	.03½	.03½	.03½	.03½
Gold Dollar	.06	.05½	....	....	Portland	1.65	1.60	1.65	1.64
Gold Sovereign	....	....	....	....	Vindicator Con	.68	.62	.68	.62
Isabella	.19½	.18½	.19½	.18½	Work	.09	.08½	.09	.08½

PHILADELPHIA, PA.

Company.	Par val.	Sept. 21 H.	Sept. 21 L.	Sept. 22 H.	Sept. 22 L.	Sept. 23 H.	Sept. 23 L.	Sept. 24 H.	Sept. 24 L.	Sept. 26 H.	Sept. 26 L.	Sept. 27 H.	Sept. 27 L.	Sales.
*Cambria Iron	$50	46½	....	46½	....	....	....	46½	....	....	....	....	....	92
Cambria Steel	50	22½	22	22½	22	22½	21½	22½	22½	23	22½	22½	22⅜	6,742
*Int.Smokel'sPwd	100	*18	....	....	....	18	17½	....	....	....	....	....	....	145
Preferred	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Lehigh C. & N	50	81½	....	....	....	81½	....	....	....	82	81½	85½	82½	1,107
Mont. Tonopah	1	....	....	2.15	....	....	....	1.90	1.85	....	....	....	....	....
Philadelphia	50	41½	41	41	....	41½	40½	42	41½	42½	42	43½	42½	10,285
Preferred	50	....	....	....	....	....	....	....	....	45½	45	45½	45½	725
Tonopah	100	8.12	8.00	8.25	8.00	8.37	8.06	8.50	8.25	8.50	8.25	....	....	....
Tonopah-Belm't	1	....	....	....	....	.60	....	....	....	....	....	....	....	....
United Gas	50	96½	94½	96½	96	97½	96	98½	97½	100	99½	99½	98½	21,280
Westmoreland C	50	....	....	....	....	....	....	....	....	....	....	....	....	....

Total sales, 40,376 shares. *Ex-dividend.

STOCK QUOTATIONS.

ST. LOUIS, MO.*

Sept. 24

Company.	Par Val.	Bid.	Ask.	Company.	Par Val.	Bid.	Ask.
Am. Nettie, Colo	$10	$0.15	$0.25	Columbia Lead, Mo	$10	$0.25	$1.00
Catherine Lead, Mo	10	.50	1.00	Con. Coal, Ill	100	14.00	15.50
Central Coal & C	100	64.50	65.00	Doe Run Lead, Mo	100	110.00	115.00
Central C. & C., Pf	100	72.00	72.50	Granite, Bimet Mt	10	.30	.45
Central Lead, Mo	100	110.00	117.00	St. Joe Lead, Mo	10	14.00	14.75

*By our Special Correspondent.

SALT LAKE CITY.*

Sept. 24

Company	Par Val	High	Low	Sales	Company	Par Val	High	Low	Sales
Butler-Liberal		$ .09½	$ .09½	1,500	May Day	$25	.07⅝	.05½	48,145
Carisa	$ 1	.10½	.09½	1,500	N. Y. Bonanza	1	.03	.02	13,900
Century		.40	.39	200	Ontario		3.90	3.90	25
Columbus Con		1.33	1.15½	2,900	Sacramento		.14½	.13½	11,200
Con. Mercur		.31	.31	1,000	Silver Shield		.04⅛	.04	13,000
Daly		2.25	2.25	100	Star Con	1	.14½	.14	3,300
Daly Judge	1	4.40	4.40	100	Tetro	1	.26¼	.26½	1,500
Daly West	20	14.25	14.00	155	Uncle Sam Con	1	.23	.19½	6,600
Grand Central		4.00	3.85	350	Victoria		1.10	1.10	500
Little Chief		.01½	.01	19,000	Victor Con		.01⅛	.01½	900

*By our Special Correspondent. Total sales, 125,875 shares.

DULUTH, MINN.

Sept. 24

Company	Par Val	Bid	Ask	Company	Par Val	Bid	Ask
Calumet & Arizona	$10	$96.00	$98.00	Lake Sup. & Pitts	$10	$45.00	$45.50
Calumet & Bisbee	10	.....	2.00	Pitts. & Duluth Dev	15	58.00	60.00
Calumet & Pittsburg	10	38.00	39.50	Shakespeare	1	.....	.20
Higgins Development	10	.....	1.00	United Mexican	10	.....	.50
Junction Development	15	35.00	35.50	Wolverine & Arizona	10	.....	2.00

MONTREAL.*

Sept 23

Company	Par Val	High	Low	Sales	Company	Par Val	High	Low	Sales
Dominion Coal	100	59.00	58.00	475	Montreal Steel	100	40.00	35.00	.....
Dom. Coal, Pf	100	.....	.....	.....	Mont'l Steel, Pf	100	85.00	.....	.....
Dom. I. & St.	100	11.50	11.37½	235	Nova Scotia St.	100	69.00	60.50	1,970
Dom. I. & St., Pf	100	37.00	36.50	200	N. S. Steel, Pf	100	106.00	100.00	63
Internat'l Coal	100	100.00	.....	....	Ogilvie	100	200.00	180.00	.....
Int'l Coal, Pf	100	100.00	.....	....	Ogilvie, Pf	100	125.00	115.00	...15

*Montreal Stock Exchange. Total sales, 2,958 shares.

MEXICO.

Sept. 24

Company	Shares Issued	Prices, Mex. Bid.	Ask.	Company	Shares Issued	Prices, Mex. Bid.	Ask.
DURANGO:				San Rafael y An., aviada	1,200	$720	$730
Ca. Min de Penoles	2,500	$2,700	$3,200	Soledad, aviada	670	940	950
San Andres de la Sierra	200	10,000	.....	Sorpresa, aviada	960	305	310
GUANAJUATO:				MEXICO:			
Angustias, Pozos	2,400	32	36	Alacran	2,400	20	28
Cinco Senores y An. aviadoras	2,000	33	35	Aldebarren	2,000	59	62
Cinco, Senores y An. aviada	400	33	35	Buen Despacho	3,000	58	64
Providencia, San juan de la Luz	6,000	55	58	Dos Estrellas	3,000	2,090	2,120
Queensland y Australia	300	8	12	La Esperanza (El Oro.)	3,000	1,500	1,500
GUERRERO:				La Reformia aviadores	2,000	27	29
Delfina, 1st serie	2,500	30	35	Santa Ana, Esperanza	2,400	60	80
Delfina, 2nd serie	2,500	25	30	MICHOACAN:			
Garduno y Anexas	7,200	35	40	Luz de Borda, aviadora	3,000	10	15
HIDALGO:				Luz de Borda, aviado	1,000	10	15
Amistad y Concordia	9,600	74	75	Santiago y An., Tlal	4,000	7	10
Carmen, aviada	1,100	115	130	NUEVO LEON:			
GuadalupeFresnillo Mill	1,000	170	200	La Fraternal	1,000	580	620
GuadalupeFresnillo Mine	1,400	70	80	Norias de Bajan	1,000	880	920
La Reina y An. aviadora	5,600	3	5	SAN LUIS POTOSI:			
Luz de Maravillas, aviadas	1,100	...	20	Concepcion y An	3,000	50	55
Maravillas y An., aviador	1,680	110	150	El Barreno, aviadora	2,000	81	82
Maravillas el Lobo	1,000	130	180	Sta. Maria de la Paz	9,600	199	200
Palma y An., aviador	1,800	4	8	San Diegoy Annexas	2,400	6	10
Refugio, aviada	12,800	680	740	ZACATECAS:			
Santa Anay An., aviadora	800	50	70	Asturiana y An	2,500	10	16
Santa Anay An., aviada	600	25	35	Candelaria y Pinos	2,500	42	45
Sta. Gertrudis y An aviadas	9,600	12	14	Esperanza y An	2,400	6	8
Sta Gertrudis y An. aviadora	28,800	74	76	Lourdes	2,500	.....	.....
Santo Tomas Apostol aviadoras	5,100	2	3	Luz de Minillas, pagadoras	2,000	.....	.....
San Felipe de Jesus aviadora	3,600	13	15	Nueva Quebradilla, aviadoras	2,400	10	20
San Felipe de Jesus aviada	1,200	5	6	Nueva Quebradilla, aviadas	600	15	25
San Rafael y An., Trompillo	1,200	1,940	1,950	San Carlos y Annexas	2,500	55	65
				Sta. Maria de Gaud.	2,500	85	90
				MISCELLANEOUS			
				Bartolome de Medina	2,000	98	102
				Naica (Chihuahua)	100	11,000	13,000
				Natividad (Oaxaca) aviadora	1,800	950	1,000
				San Francisco Hac	6,000	104	106
				Union Hacienda	3,000	325	360

LONDON.

Sept. 16

Company.	Shares Issued.	Par value. £ s. d.	Latest dividend. Amt. s. d.	Date.	Quotations. Buyers. £ s. d.	Sellers. £ s. d.
American:						
Alaska-Treadwell	200,000	5 0 0	2 0	July, 1904	4 12 6	4 17 6
Anaconda	1,200,000	5 0 0	2 0	May, 1904	4 11 3	4 13 9
Camp Bird	820,000	1 0 0	9	Aug., 1904	1 8 3	1 8 9
Copiapo	112,500	2 0 0	6 10	May, 1903	1 0 0	1 5 0
De Lamar	80,000	1 0 0	1 6	May, 1904	13 9	16 3
El Oro	1,080,000	1 0 0	9	July, 1904	1 1 3	1 3 9
Esperanza	455,000	1 0 0	6	Aug., 1904		
Frontino & Bolivia	128,662	1 0 0	3 0	July, 1901	8 6	9 6
Le Roi	200,000	5 0 0	5 0	Nov., 1899	13 9	16 3
Le Roi No. 2	120,000	5 0 0	1 0	June, 1904	11 3	13 9
Palmarejo & Mexican	445,000	1 0 0	rts.	Apr., 1903	8 3	8 9
Standard	500,000	4 0	2½	Sept., 1903	2 0	3 0
Stratton's Independence	1,000,007	1 0 0	6	Dec., 1903	2 6	3 0
St. John del Rey	546,265	1 0 0	6	Dec., 1903	11 0	12 0
Tomboy	300,000	1 0 0	1 0	June, 1902	1 0 0	1 5 0
Ymir	200,000	1 0 0	1 0	Mar., 1902	2 6	5 0
European:						
Linares	15,000	3 0 0	5 0	Sept., 1904	3 15 0	4 5 0
Mason & Barry	185,172	1 0 0	7 0	May, 1904	2 17 6	3 2 6
Rio Tinto	325,000	5 0 0	37 6	May, 1904	55 15 0	56 0 0
Rio Tinto, preferred	325,000	5 0 0	2 6	May, 1904	6 0 0	6 5 0
Tharsis	625,000	2 0 0	7 0	May, 1904	4 7 6	4 12 6
West Australian:						
Associated	495,388	1 0 0	2 6	July, 1904	1 13 9	1 16 3
Cosmopolitan	400,000	1 0 0	1 0	Apr., 1904	6 3	6 9
Golden Horseshoe	300,000	5 0 0	6 0	Aug., 1904	5 17 6	6 0 0
Great Boulder	1,750,000	2 0	9	Sept., 1904	18 6	19 0
*Gt. Boulder Persever'ce	1,400,007	1 0 0	1 0	Sept., 1904	9 6	10 0
Great Fingall	250,000	1 0 0	7 0	July, 1904	7 10 0	7 12 6
Ivanhoe	200,000	5 0 0	5 0	July, 1904	7 1 3	7 3 9
Kalgurli	120,000	1 0 0	2 6	Oct., 1904	5 0 0	5 2 6
Lake View	250,000	1 0 0	rts.	Aug., 1902	1 0 0	1 2 6
Oroya-Brownhill	450,000	1 0 0	3 0	Sept., 1904	3 0 0	3 2 6
Miscellaneous:						
*Brilliant Central	100,000	1 0 0	1 0	Sept., 1904	2 6 3	2 8 9
Briseis	600,000	1 0 0	.....	.....	9 6	10 0
Broken Hill	960,000	8 0	1 0	Aug., 1904	1 18 9	2 0 0
Mt. Lyell	275,000	3 0 0	1 3	June, 1904	11 6	12 6
*Mt. Morgan	1,000,000	1 0 0	3	Oct., 1904	2 0 0	2 2 6
Waihi	497,412	1 0 0	2 6	Sept., 1904	5 10 0	5 12 6
Indian:						
*Champion Reef	513,832	10 0	1 4	Sept., 1904	1 11 6	1 12 6
Mysore	566,043	10 0	4 6	July, 1904	6 8 9	6 11 3
Nundydroog	484,000	10 0	1 3	July, 1904	1 14 6	1 15 6
Ooregum	343,000	10 0	1 3	Aug., 1904	16 6	17 6
Ooregum, pfd	240,000	10 0	4	Aug., 1904	1 8 9	1 11 3
South African:						
Angelo	600,000	1 0 0	7 0	Aug., 1904	6 15 0	6 17 6
Bonanza	200,000	1 0 0	8 0	Aug., 1904	1 1 3	1 3 9
British South Africa	4,436,019	1 0 0	rts.	May, 1899	1 10 0	1 11 3
Cape Copper	300,000	2 0 0	2 6	July, 1904	3 10 0	3 15 0
Cape Copper, pfd	75,000	2 0 0	2 6	July, 1904	3 7 6	3 12 6
City & Suburban	340,000	4 0 0	4 0	Aug., 1904	5 3 9	5 6 3
Consol. Gold-Fields	2,000,000	1 0 0	.....	.....	6 1 3	6 3 9
Crown Reef	120,000	1 0 0	6 0	Aug., 1904	14 10 0	15 0 0
*De Beers, preferred	800,000	2 10 0	10 0	Aug., 1904	18 1 3	18 3 9
*De Beers, deferred	1,000,000	2 10 0	12 6	Aug., 1904	18 8 9	18 11 3
East Rand	990,000	1 0 0	5 0	July, 1903	8 0 0	8 1 3
Ferreira	90,000	1 0 0	22 6	Aug., 1904	20 5 0	20 15 0
Geldenhuis	200,000	1 0 0	7 0	Aug., 1904	5 8 9	5 11 3
Geduld	400,000	1 0 0	rts.	Mar., 1902	6 2 6	6 5 0
Henry Nourse	125,000	1 0 0	8 0	Aug., 1904	7 17 6	8 2 6
Jubilee	50,000	1 0 0	5 0	Aug., 1904	4 12 6	4 17 6
Jumpers	100,000	1 0 0	2 6	May, 1904	2 15 0	3 0 0
Langlaagte	470,000	1 0 0	2 0	Aug., 1904	3 10 0	3 12 6
May	288,750	1 0 0	3 0	Aug., 1904	3 18 9	4 1 3
Meyer & Charlton	100,000	1 0 0	5 0	Aug., 1904	5 5 0	5 10 0
Modderfontein	290,000	1 0 0	rts.	Apr., 1902	8 11 3	8 13 9
Namaqua	94,331	2 0 0	3 0	Dec., 1903	2 15 0	3 0 0
New Jagersfontein	200,000	5 0 0	10 0	June, 1904	26 15 0	27 5 0
New Primrose	325,000	1 0 0	3 0	Aug., 1904	3 11 3	3 13 9
Rand	1,795,956	5 0 0	5 0	Aug., 1902	10 2 6	10 5 0
Robinson	750,000	5 0 0	6 0	Aug., 1904	9 2 6	9 7 6
Robinson Deep	950,000	1 0 0	3 0	Aug., 1904	5 3 9	5 6 3
Rose Deep	425 000	1 0 0	3 0	Aug., 1904	8 10 0	8 15 0
Salisbury	100,000	1 0 0	2 0	Sept., 1904	1 15 0	1 17 6
Village Main Reef	400,000	1 0 0	4 0	July, 1904	6 7 6	6 8 9
Wemmer	80,000	1 0 0	12 6	July, 1904	10 10 0	11 0 0

*Ex-dividend

LONDON (By Cable.)*

Company	Sept. 21 £ s. d	Sept. 28 £ s. d	Company	Sept. 21 £ s. d	Sept. 28 £ s. d
Camp Bird	1 8 3	1 8 3	Esperanza	19 0	17 6
Con. Gold Fields	6 2 6	6 0 0	Modderfontein	8 13 9	8 8 9
De Beers	18 12 6	18 12 6	Rand Mines	10 3 9	10 3 9
Dolores	1 5 0	1 6 0	Rio Tinto	56 10 0	56 15 0
East Rand	1 8 3	7 18 9	Simmer & Jack	13 9	1 13 9
El Oro	1 1 10½	19 4½	Tomboy	1 0 0	1 0 7½

*Furnished by Wm. P Bonbright & Co., 15 Wall St., New York

PARIS.

Sept. 8.

Company.	Location.	Capital Stock. Francs.	Par value. Fr.	Latest dividend Fr.	Prices. Opening Fr.	Closing Fr.
Anzin, Coal	France	.....	.....	290.00	5,750.00	5,750.00
Boleo, c	Lower Cal.	12,000,000	500	104.17	2,070.00	2,228.00
Champ d'Or, g	S. Africa	3,375,000	25	3.75	17.50	16.75
Courrieres, Coal	France	600,000	500	110.00	2,885.00	2,899.00
Fraser River, g	Brit. Col.	250,000	25	.....	5.50	5.50
Huanchaca, s	Bolivia	40,000,000	125	2.50	93.50	92.75
Laurium, s. l	Greece	16,300,000	500	25.00	306.00	309.00
Malfidano, z	Italy	12,500,000	500	50.00	625.00	615.00
Metaux, Cie. Fran. de	France	25,000,000	500	22.50	500.00	505.00
Mokta-el-Hadid, i. l	Algeria	18,312,000	500	40.00	975.00	1,010.00
Nickel, n	N. Caledonia	15,000,000	250	22.50	595.00	622.00
Penarroya, Coal	Spain	.....	500	45.00	1,120.00	1,130.00
Vielle Montagne z	Belgium	9,000,000	30	30.00	790.00	784.00

c—Copper. g—Gold i—Iron. l—Lead. n—Nickel. o—Oil. s—Silver. z—Zinc.